MOTOROLA

LANPlanner® Solo

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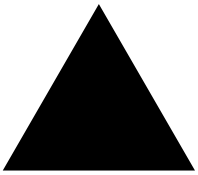
Revised 1/6/06

User's Manual



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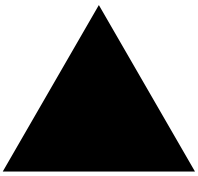


Preface

Introduction

Thank you for choosing LANPlanner Solo, the revolutionary software that saves you time creating a wireless communication network. LANPlanner Solo is easy to use, and its features allow you to make critical wireless network design and deployment decisions in a fraction of the time that other methods require. LANPlanner Solo also incorporates powerful 3D display capabilities that make this software a leading product in its industry. Combined with many other features, this state-of-the-art software package will help you see a quick return on your investment.

This document serves as a guide to installing and using LANPlanner Solo. It is recommended that first time users read this document in its entirety to become familiar with the software's vast capabilities and our recommended approach to using the software most efficiently.

Although we believe you will find this software easy to use, designing a wireless network is no simple matter. LANPlanner Solo performs much of the guess work and all of the complicated mathematical engineering calculations for you, but a basic understanding of wireless network fundamentals will help you better understand the results this software produces. For those new to wireless network design (and as a refresher for the rest), see "Understanding Wireless Network Design" on page 13 and the section below on common terminology.

WLAN Design Terminology

This section provides definitions for some common wireless network design terminology that are used throughout this manual.

802.11a	802.11a is a Wi-Fi standard that provides eight channels in the 5GHz frequency band. The theoretical speed of 802.11a data transmissions is 54Mbps.
802.11b	802.11b is a Wi-Fi standard in the 2.4GHz band that provides 14 channels (only 11 of which can be used in the United States). The theoretical speed of 802.11b data transmissions is 11Mbps.
802.11g	802.11g is a Wi-Fi standard in the 2.4Ghz band that uses the same channels as 802.11b. The theoretical speed of 802.11g data transmissions is 54Mbps.
access point	Access Point, also referred to as an AP, is a transmitting device that acts as a hub for communications between a wireless client and a wired network.
AP	See access point
base station	See access point

attenuation	Attenuation refers to the amount that something is reduced. For instance, radio signal is attenuated in amplitude when it travels through a building wall. Radio signal also attenuates as it travels through free space.
CAD	CAD stands for Computer Aided Design, but most often refers to computer software that aids in the drawing aspect of designing.
channel	Channel refers to a number that is assigned to a particular center frequency within a wireless standard and a corresponding bandwidth. For instance, the 802.11b standard has 14 channels and the name Channel 1 refers to a center frequency of 2412Mhz with a bandwidth of 22Mhz, specifically.
floor attenuation factor	See also attenuation. Floor attenuation factor, commonly referred to as FAF, is the amount of attenuation incurred by radio signal propagating from one floor to another floor.
forward link	Forward link (sometimes called downlink) refers to RF transmissions traveling from the primary transmitting source (or hub of communication, commonly an access point) to one or more receivers.
frequency	See also channel. When people use the term frequency in regards to designing a wireless communications system, they are most often referring to a transmitting channel as defined by a wireless standard. From a physics perspective, frequency refers to the number of times a signal oscillates in 1 second, expressed in base units of Hertz.
interference	Interference occurs when one radio wave causes distortion in another radio wave's form. This most often occurs when two transmitters transmit on the same or overlapping channels.
multipath	Multipath refers to the multiple paths any given signal makes towards a destination point in space. In an indoor environment, a signal will diverge into more than one physical wave, each traveling in different directions (due to reflection of obstructions). Receivers may receive one or more of these multipath signals, and can often combine the individual waves to better understand the originally transmitted signal.
noise	Noise refers to radio signal that is undesired or indistinguishable by the receiver.
reverse link	Sometimes called uplink. Refers to RF transmissions traveling from the primary receiver (a mobile computer) back to the primary transmitter. Reverse link is the opposite of forward link.
RF	RF stands for radio frequency.
RSSI	RSSI (Received Signal Strength Indications) most often refers to the power level of a received signal. RSSI is often used to simply mean signal strength.
signal strength	Signal Strength refers to the amount of power (usually measured in dBm, which is power relative to one milliWatt) of a received signal.
SIR	SIR stands for the ratio of a desirable signal's power to the signal power of the combined interfering sources.
SNR	SNR stands for the ratio of signal to noise.

Naming Conventions

The table below lists conventions that are used throughout this User's Guide:

Icon	Type	Alerts you to...
	Note	Important features or instructions.
	Caution	Risk of system damage, or loss of data.

Related Documentation

LANPlanner Solo Quick Start Guide

The Quick Start Guide can be accessed from the LANPlanner Solo software by selecting Start > Programs > LANPlanner Solo > Quick Start Guide.

Getting Support

If you have issues with the installation, configuration, or use of this software, please contact product support at rfsoftwaresupport@motorola.com, or call (USA) (512) 821-1560.

1 Introduction to LANPlanner Solo

LANPlanner Solo Overview

LANPlanner Solo is a revolutionary software package that enables you to efficiently design, model, and measure 802.11a, 802.11b, and 802.11g networks. Building facilities and campus environments can be quickly modeled using menus that guide you step-by-step. You can quickly place access points and predict signal coverage during the WLAN design phase. Post-WLAN deployment, you can use LANPlanner Solo's powerful features for measuring network performance and validating network designs.

This User's Guide is structured to help you get the information that you need to quickly start using even the most advanced features of this product. The chapters present information in the same order as the recommended workflow for completing a network design from start to finish. We recommend that you take time to review this manual before you begin using the software. Although LANPlanner Solo has been designed to be easy to use out-of-the-box, you will undoubtedly find time saving tips by referring to this manual frequently.

Hardware Requirements

To run LANPlanner Solo, the following computer platform is recommended:

- Pentium III processor or later
- 500 MHz minimum processor speed (800 MHz or higher recommended)
- At least 256 megabytes of RAM
- 100 megabytes of available hard drive space for installation, and at least 200 megabytes free after installation
- Microsoft Windows 2000 or Windows XP (administrative rights are required for installation)
- Internet Explorer 6.0 or higher

Installation Procedure

Installing LANPlanner Solo is much like installing any other Windows compatible software. However, LANPlanner Solo uses electronic license control, so an extra activation step will be required. In order to install LANPlanner Solo, you will need your installation CD, and some way to transfer files to your PC or receive email directly on your PC.

If you have problems installing your software, please contact customer support at (512) 821–1560, or via email at rfsoftwaresupport@motorola.com.

Preparation

It is **very important** to perform some preparatory steps so that your installation goes smoothly. A Quick Start Guide is included with your software package. Please read this now.

- **Windows Service Packs:** If your operating system has not been updated with the latest Microsoft Windows Service Packs, visit the Microsoft support web site, download the service packs and install them. Your software will work best running under Windows 2000 or Windows XP with the most recent updates.
- **Internet Explorer Upgrades:** To run functionality contained in Network Design and Network Verification, the WININET libraries distributed with Microsoft Internet Explorer 6.0 or higher are required. If you do not have access to these libraries or Internet Explorer, please contact customer support.
- **Backing Up Previous Work:** If you are upgrading a previous installation of LANPlanner Solo, it is recommended that you back up your **Workspaces** folder, **Antennas** folder, and **BOM** folder prior to installation. These folders are located in the root installation directory for your installed software. The proper procedure to back up your work is detailed in the Quick Start Guide accompanying the software.
- **Administrative Privileges Required for Install:** LANPlanner Solo must be **installed** by a user with local administrative privileges. Non-administrative users may **use** the software once it has been installed.

Installation

To install LANPlanner Solo, please follow these steps in the order presented:

1 Close any programs running within Windows before starting the installation process.

2 Log on as **Administrator**, or as a user with administrative or power user privileges. Some of the actions required for software installation require extra privileges, though you can use the software without those privileges.

3 Insert the CD into the drive.

4 If **Autorun** is activated on your computer, the setup program will start automatically. Otherwise, run **SETUP.EXE** from the root folder on the product CD.

5 Read the warnings and the license agreement. You must accept the license agreement to continue.

6 Enter the user information, including your name, the name of your company and the company licensee. Enter the serial number exactly as shown on the back of the CD case.

7 Choose the destination folder where the program files will be stored on the hard drive. We recommend you accept the default folder name. If you choose a hard drive other than the default C: drive, be sure to also type in a directory name; e.g. click on your D: drive and then type in **Program Files\LANPlanner Solo**\.

8 Click **Next** to begin the installation process.

9 When setup is complete, you are ready to run the software by going to the Windows **Start** menu and selecting **Programs** > **LANPlanner Solo** > **LANPlanner Solo**.

License Activation

- When LANPlanner Solo starts running you will receive a message that **“An activation code for your software could not be obtained”**. This software requires a valid activation code to run properly.
- Activation codes enforce your software license agreement. Activation codes are only available via customer support. Contact customer support at rfsoftwaresupport@motorola.com to obtain an activation code. To do so, you must provide your product name, version, serial number, and lock code. See “Managing Software Licenses” on page 50 for further details.
- When you click **OK** in the dialog box, you will reach the **License Maintenance** dialog box. See “Managing Software Licenses” on page 50 or further details.

- Please keep in mind that the electronic license control mechanism is merely an enforcement method for the terms of the end user license. Regardless of the functions of the electronic license control, you are bound by the terms of the software end user license agreement.

Installation on Multiple PCs

According to the license agreement, your software can only be installed on one PC. License unlock codes will not be provided for multiple PCs.

Understanding Wireless Network Design

Some general knowledge is important for designing a wireless communications network using 802.11a, b, or g technologies. By no means is this section meant to be complete or comprehensive, but it should serve as a general introduction for someone who has limited knowledge of designing and deploying wireless networks.

Wireless Network Basics

Designing a WLAN and deploying an access point can be a relatively easy task, but problems hindering the quality of the network quickly multiply when multiple access points are involved. The proximity of access points to users and to each other, access point channel settings, and access point power settings can all affect the performance of the wireless network.

Most people consider application level throughput to be a good indicator of network performance. There are many factors that contribute to the performance of a wireless network; however, two metrics are usually considered in wireless designs to ensure that an acceptable level of throughput is obtained in desired coverage areas: signal strength and interference.

Several important factors directly affect signal strength. Signal strength near an access point (same room to several tens of feet away) is considered very strong and is directly related to the access point's output power level. Signal strength, however, decreases as you move farther away from the access point (referred to as attenuation). Another key factor that contributes to diminished signal strength are obstructions, such as walls and wall-like metal shelving. In general, it is safe to ignore obstructions such as people and furniture when modeling a facility for signal coverage because their overall affect on signal strength is minimal. Keep in mind that different construction materials attenuate RF signal in different ways.

RF interference can also affect application level throughput. RF interference occurs when radio signals transmitted on overlapping frequency ranges (or channels) cause a distortion in the radio wave pattern. Two access points that operate on the same channel and within close proximity of each other cause interference when transmitting at the same time. Beware that 802.11b and 802.11g use the same frequency range and can be affected by common items such as microwaves and cordless telephones.

Steps to Completing a Wireless Network Design

This section provides you a brief overview of a common suggested workflow through LANPlanner Solo (see Figure 1.1 below). This workflow describes how most people will work with LANPlanner Solo to complete a wireless system design. This workflow is intended to give you a better understanding of how to get started using this software. As your knowledge of this product matures, you may find more productive ways to use the software as your needs require.

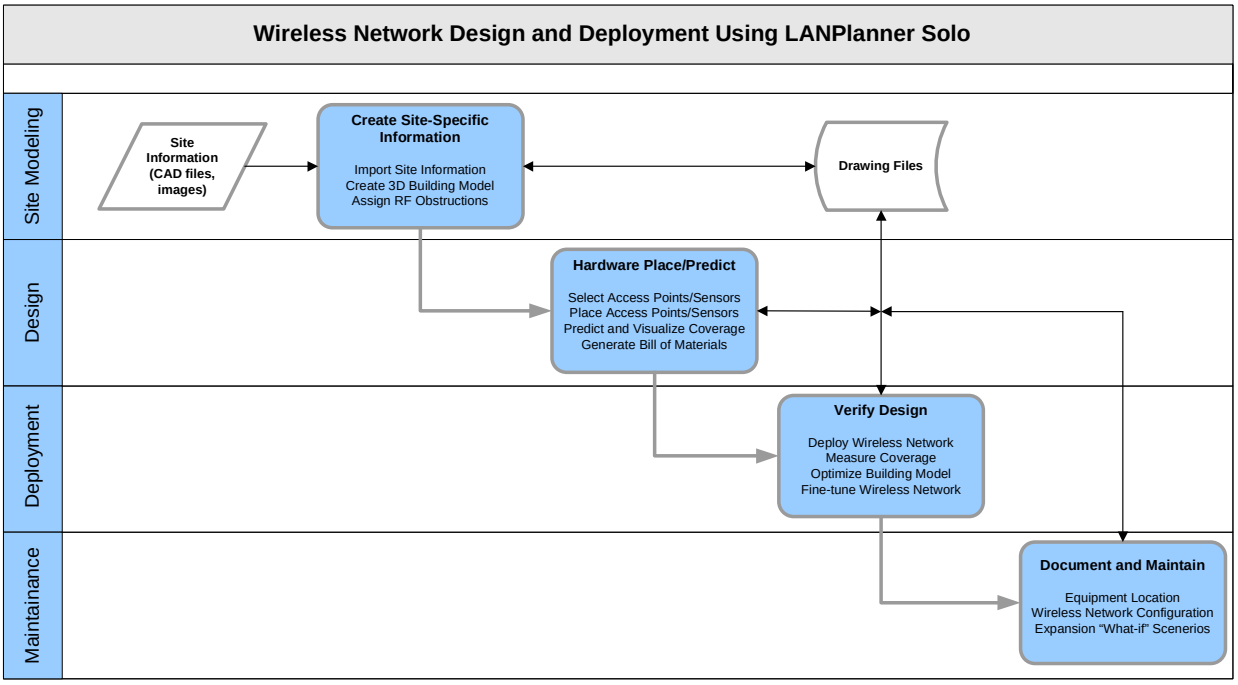


Figure 1.1: Wireless Network Design and Deployment Workflow

Before Getting Started

There are several things to consider before beginning your wireless network design:

- What do the facility's floor plans look like?
- What common construction materials is the facility made of (brick, drywall, concrete, etc.)?
- Where will the wireless network equipment be located?
- What are the design requirements such as the number of users per access point, their applications, and the wireless network bandwidth that needs to be met?

Answers to these questions vary from location to location; however, it is important to consider each of the above questions throughout the design process.

Site Modeling - Create Site-Specific Information

The first step in wireless network design is to model the facility or facilities that will be considered for wireless coverage. LANPlanner Solo requires a specially formatted drawing file that properly represents the building obstructions that may significantly affect RF signal coverage. The drawing file contains information about the location of walls and other obstructions, and the type of construction material. The LANPlanner Solo **Format Building** menu (See “Modeling a Building” on page 63) provides powerful functionality for modeling your building or campus quickly and easily. The Format Building menu supports three basic “starting points” for generating the three-dimensional drawing of a facility.

- Start with a previously drawn CAD file.
- Start with a scanned image
- Start with a basic concept of the facility layout (requires free-hand sketch of the facility)

Most large building facilities are designed in a CAD (Computer Aided Design) software package. There are many different CAD file formats, but one of the most common is the .dwg and the .dxf file formats. LANPlanner Solo supports importing CAD files of this format directly. If you can obtain the CAD files for your facility, this makes a great starting place for modeling the building.

Another convenient option is to simply obtain a sketch of the drawing facility from either a blueprint, fire escape exit map, or an aerial photo (if modeling a campus environment). LANPlanner Solo supports importing many common image formats such as bitmaps.

If you are unable to obtain a computer file containing information about your campus or building facility, then LANPlanner Solo allows you to sketch a diagram of the building facility. This option will most likely require that you have either visited the facility, been told its basic structure, or previously seen a diagram of the facility.

LANPlanner Solo does not require that every facility wall or obstruction be modeled to 100% accuracy, but the accuracy of the software’s predictive engine depends on the modeled facility. It is important to model any major obstructions and the general location and scale of building walls in order for the predictive engine to produce useful results.

Once you have obtained information on your facility or campus environment, see Chapter 4 for detailed instructions on modeling the facility in LANPlanner Solo.

Design - Hardware Placement and Prediction

After you have modeled your building or campus environment using LANPlanner Solo’s Building Wizard, you are ready to begin designing the wireless network. Designing the wireless network involves using the functionality provided by the **Network Design** menu. The design step includes:

- Selecting wireless access points and sensors
- Placing the access points and sensors
- Predicting and visualizing wireless signal coverage
- Generate a comprehensive Bill of Materials (BOM) of all wireless equipment in your design

LANPlanner Solo allows you to model every important aspect of your system design so that it can predict the network’s performance as accurately as possible. Using the **Network Design** menu is described in Chapter 5.

Deployment - Verifying Your Design

After deploying your wireless network, you can use **Network Verification** within LANPlanner Solo to help verify signal coverage and optimize your building model. Post-deployment signal coverage verification is beneficial for one or more of the following reasons:

- Informs you of potential flaws in your original design by determining if the network performs as originally predicted.
- Provides LANPlanner Solo with building model RF characteristics that can be archived for modifying future designs in the same building, or other buildings of similar construction.
- Enables building model optimization and wireless network fine-tuning.
- Documents the quality of the network as originally installed.

Wireless network verification and optimization is performed using the **Network Verification** menu, which is described in Chapter 6.

Maintenance - Document and Maintain Your Wireless Network

After completing your wireless network design in LANPlanner Solo, physically deploying the network, and verifying the network's performance, you can continue to use LANPlanner Solo as a documentation system to identify equipment locations, wireless coverage, and configuration (power levels, channels, etc). This information can be vital to fixing future network problems or generating "what-if scenarios" for expanding the network. LANPlanner Solo's documentation and archiving capability frees up IT staff from depending on the knowledge of those who originally created the wireless network.

Wireless network maintenance is an ongoing and iterative process. Maintenance tasks include expansion (see Chapter 4, Chapter 5), verification (Chapter 6), and report generation (Chapter 7).

LANPlanner - Solo Edition

The Solo edition of LANPlanner gives you the full functionality of a cutting-edge wireless design tool, one drawing at a time. By choosing to work with only one or more select drawing files, you can:

- Try out the software for a pilot project without making a bigger investment in the full product suite.
- Take advantage of all LANPlanner's features at a price point that is cost effective for single projects.
- Include the cost of the software into the proposal process.

Using LANPlanner Solo

Because the Solo edition of LANPlanner is limited to working with specific drawing files, an extra step is required in the design process. After completing your facility model using the Building Wizard, you will be prompted to email the drawing to rfsoftwaresupport@motorola.com. Upon receipt, Motorola will attach a key to the drawing file which unlocks the Network Design menu, enabling you to place hardware and run RF predictions. Once unlocked, you will be unable to add floors to the drawing or make significant modifications to the building model.

Determining Your Edition

The section above applies only to users of the Solo edition of LANPlanner. The most notable difference in LANPlanner Solo is that the Network Design menu is disabled until you begin working with a keyed drawing file:

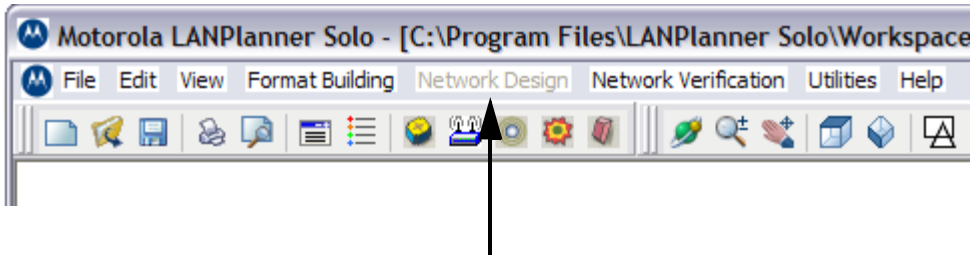


Figure 1.2: Disabled Network Design Menu

2 Graphical User Interface

Introduction

This chapter provides the information you need to become familiar with the LANPlanner Solo Graphical User Interface (GUI) and extensive menu options.

LANPlanner Solo GUI Layout

Launch LANPlanner Solo from the Windows **Start** menu by selecting **ProgramsPrograms > LANPLanner Solo > LANPlanner Solo** or by double-clicking the LANPlanner Solo icon from your Windows desktop:

Figure 2.1: LANPlanner Solo icon

When the LANPlanner Solo GUI opens, note the major features:

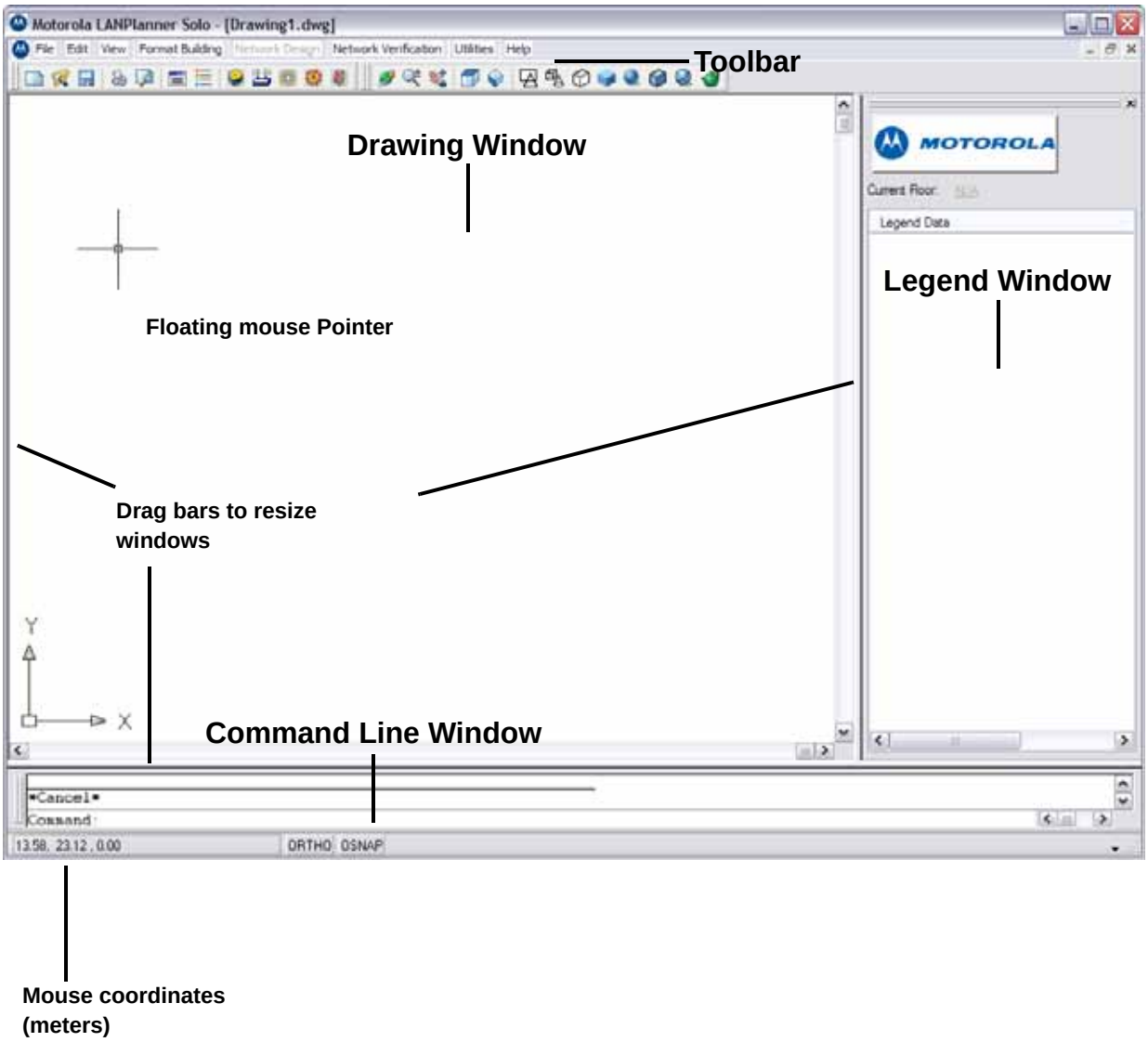


Figure 2.2: LANPlanner Solo Graphical User Interface (GUI)

Whenever you change LANPlanner Solo's window size, user preferences, or the project workspace, all settings are saved upon exiting the tool. These saved settings are restored the next time that you launch LANPlanner Solo.

Toolbar Icons

The toolbar icons below quick-link to LANPlanner Solo commands:

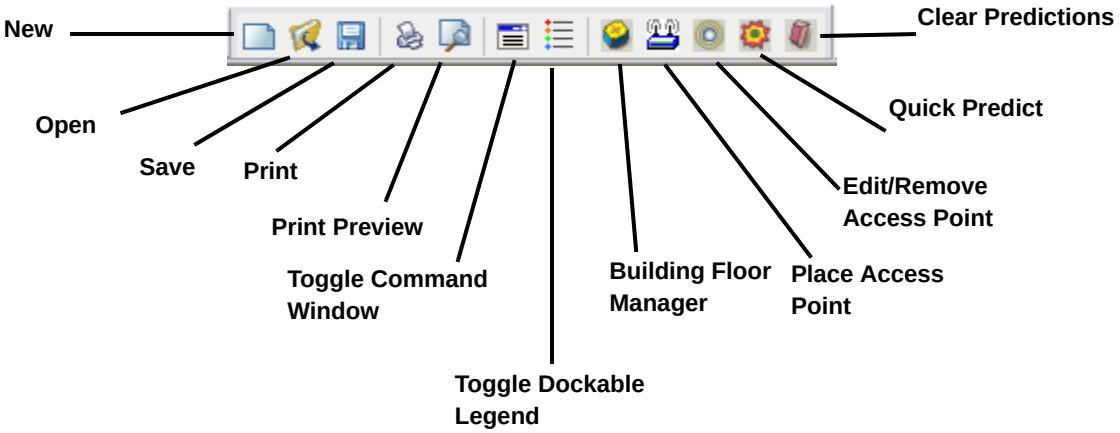


Figure 2.3: Toolbar Icons - Actions

The toolbar icons below allow you to manipulate the drawing views:

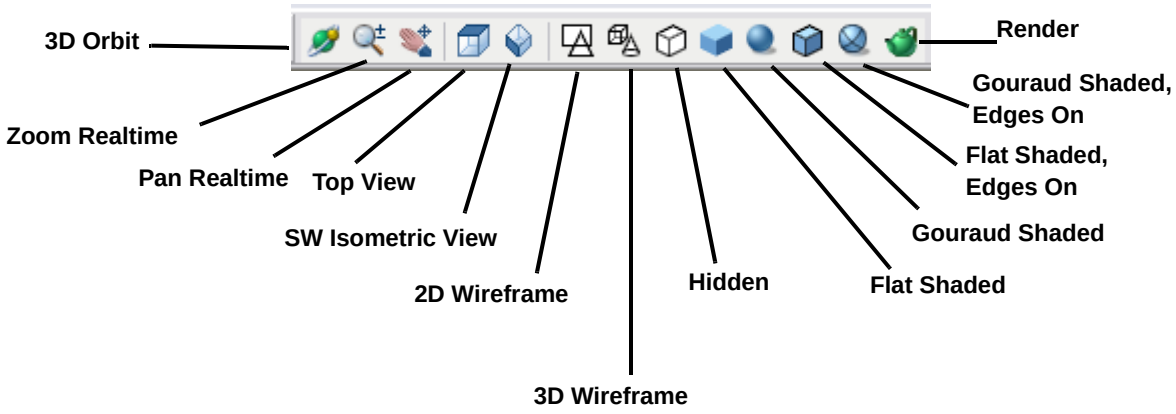


Figure 2.4: Toolbar Icons - Drawing Views

Menu Structure

LANPlanner Solo has been designed with an organized menu structure designed to allow you to quickly access similar features from within the same menu. The following sections provide a brief overview of each toolbar menu and the functionality that is provided by the submenu commands.

File Menu

The **File** menu provides the ability to create and open project workspaces, create, open, and save drawings, and export drawings into a wide range of file formats. The **File** menu is shown in Figure 2.5:

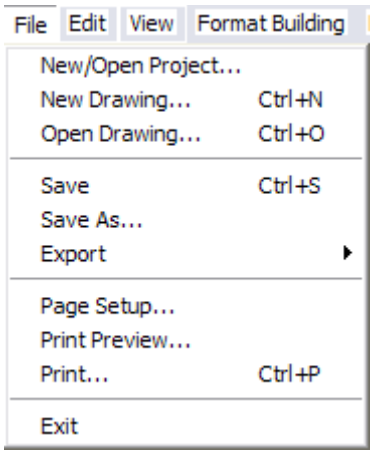


Figure 2.5: File menu

New/Open Project	Allows you to open an existing project workspace or create a new project workspace.
New Drawing	Creates a new empty drawing that can be used to construct a floor plan.
Open Drawing	Opens an existing LANPlanner Solo compatible drawing file (*.dwg).
Save	Saves the current drawing at its existing location with its current name.
Save As	Saves the current drawing with a different name and/or file path.
Export	Saves the current drawing in a number of different formats (for example, Windows Metafile, Bitmap, Encapsulated Postscript, and so on.). It is important to remember that LANPlanner Solo can only function properly on *.dwg files, so files exported into another file format may not be recoverable as a LANPlanner Solo drawing file.
Print Setup	Allows you to configure page layout settings for printing.
Print Preview	Preview a print job. To exit the print preview, press the **ESC** key, space bar, or click the right mouse button.
Print	Opens the **Print** dialog box which allows you to print the drawing exactly as its currently displayed on screen.
Exit	Exits the LANPlanner Solo program. If you have made changes to the current drawing, you will be asked if you would like to save changes to the current drawing.

Edit Menu

The **Edit** menu, shown in Figure 2.6, provides the standard Windows file editing capability. These commands are for editing the partitions and other entities in your drawing file (*.dwg).

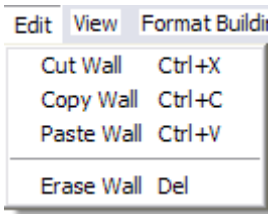


Figure 2.6: Edit menu

Cut Wall	Removes selected objects from the drawing and places them on the Windows Clipboard. To insure drawing information stability, LANPlanner Solo does not allow certain entities (such as access points) to be cut from the database. Instead, use the appropriate command within the **Network Design** menu.
Copy Wall	Copies selected wall objects to the clipboard.
Paste Wall	Inserts data from the clipboard.
Erase Wall	This command removes the selected objects from the drawing without placing them on the Windows Clipboard.

View Menu

The **View** menu offers powerful capabilities for displaying your drawing and predictions in a variety of ways. You can alter the current view of the building environment, refresh, zoom, and pan the drawing. The **View** menu also allows you to change the appearance and perspective of predictions and measurements.

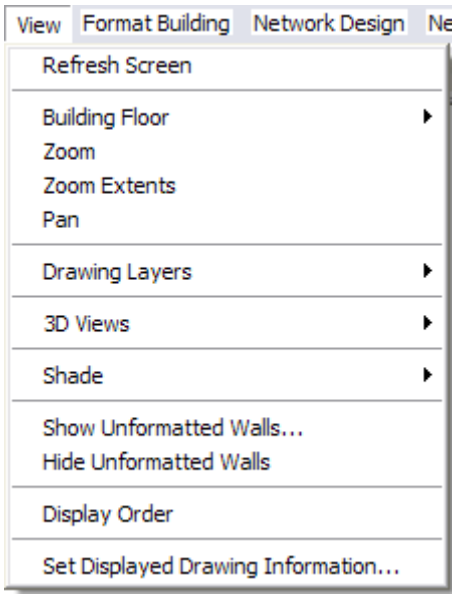


Figure 2.7: View menu

Refresh Screen	Refreshes the display. Use this command when partitions, predictions, or other drawing data disappear that should be visible. This is sometimes necessary if a command is cancelled by hitting the **ESC** key when the command is partially completed. If a command is aborted prior to the completion process, the display may be left in an interim state. The **Refresh Screen** command will bring the display up to date.
Building Floor	Opens a fly-out menu that includes commands for selecting and viewing floors.
Zoom	Select **Zoom** to enable real-time zooming. Once real-time zooming is activated, click and hold the left mouse button while moving the mouse up or down to zoom in or out, respectively. Press **ESC** to cancel.
Zoom Extents	Zooms to display the entire drawing. Zooming to the drawing extents will effectively show all of the visible objects in the drawing window.
Pan	Use **Pan** to move left, right, up or down in your view of the drawing. Pan is an alternative to using the scrollbars. When this menu option is selected, the cursor changes to a hand, and allows the user to drag the screen image around with the left mouse button. From this mode, the right mouse button brings up the zoom menu.
Drawing Layers	These set of commands allows you to show/hide unformatted and formatted autocad layers.
3D Views	This command allows you to have menu access to the 3D Orbit, Top, and Southwest Isometric Views
Shade	The commands under this fly-out menu quickly fill in the objects in the drawing.

Show Unformatted Walls	This command presents you with a list box of available layers in the drawing that are not LANPlanner Solo formatted layers. You can then choose one or more layers from the list box to make visible in the current viewport. This is useful when attempting to remove unused entities from a drawing.
Hide Unformatted Walls	This command makes all unformatted drawing layers invisible.
Display Order	This command allows you to change the display order of a image that has been imported into the drawing. Changing the display order will change whether other entities in the drawing are displayed in front of or behind the image. Entities that are displayed behind an image may not be visible. When this command is selected, you are prompted in the text window at the bottom of the main program window, to select items. These items are the images whose display order will be changed. Left-click on the image that is obscuring your partitions, to select it, then right click. You will receive a prompt in the text window asking how the display order is to be changed. Typing '**B**' for back, and hitting the **return** key will move the partitions to the back of all other visible entities. Use of the other options, that is, moving images to the front, or putting them above or below specific partitions, is not recommended.
Set Displayed Drawing Information	This command brings up a **Display Options** dialog described in "Set Displayed Drawing Information Dialog" on page 26, below.

Set Displayed Drawing Information Dialog

The **Set Displayed Drawing Information** dialog helps you to reveal or hide the various entities such as access points, ceiling and floor tiles, contours, and antenna patterns.

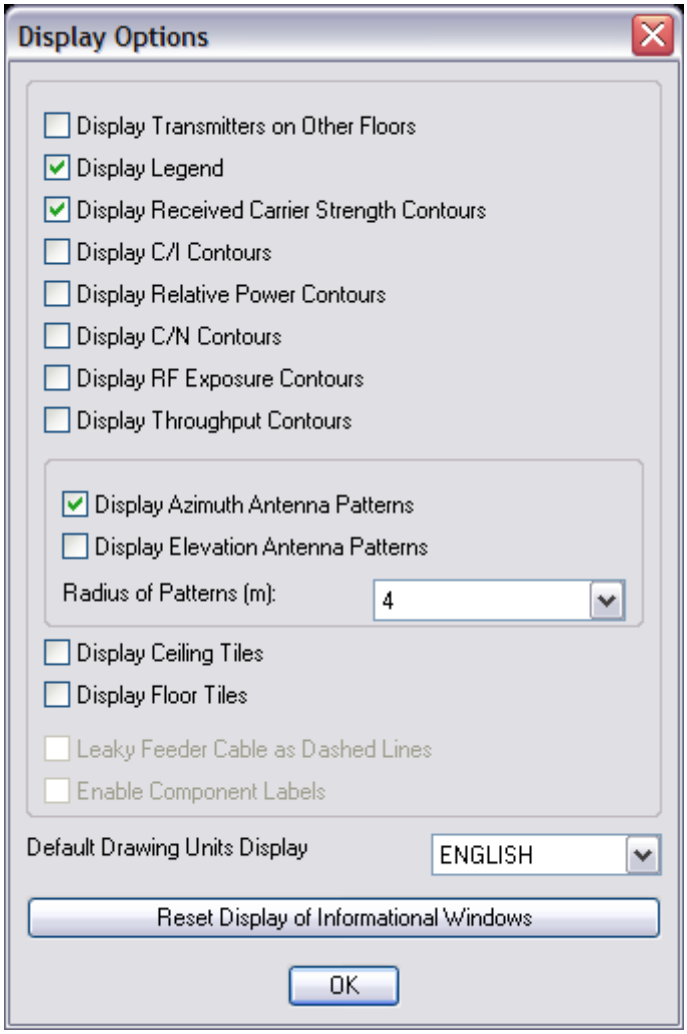


Figure 2.8: Set Displayed Drawing Information Dialog

Display Transmitters on Other Floors	When this checkbox is activated, the complete antenna system of all access points on all floors will be visible at all times. When not checked, only access points on the current floor will be visible.
Display Legend	When this checkbox is activated, the legend in the drawing will be visible, displaying information about the meaning of colors of partitions and of prediction results.
Display Received Carrier Strength Contours	Check this box to display RSSI contour coverage prediction results that have been generated by the software's prediction engine. This does not remove the results from the drawing, but merely makes them invisible.
Display C/I Contours	Check this box to display SIR contour coverage prediction results that have been generated by the software's prediction engine. This does not remove the results from the drawing, but merely makes them invisible.

Display C/N Contours	Check this box to display SNR contour coverage prediction results that have been generated by the software's prediction engine. This does not remove the results from the drawing, but merely makes them invisible.
Display Throughput Contours	Check this box to display peak data rate contour coverage prediction results that have been generated by the software's prediction engine. This does not remove the results from the drawing, but merely makes them invisible.
Display Azimuth Antenna Patterns	Check this box to display the azimuth antenna footprint of visible antennas.
Display Elevation Antenna Patterns	Check this box to display the elevation antenna footprint of visible antennas. **NOTE** ***NOTE:*** *If both the* ***Display Azimuth Antenna Patterns*** *and* ***Display Elevation Antenna Patterns*** *are activated, LANPlanner Solo displays the full three-dimensional antenna pattern.*
Radius of Patterns (m)	If you have chosen to display antenna patterns, this number is the outer radius of the pattern. Adjusting this setting controls the perceived size in meters of antenna patterns on the screen.
Display Ceiling Tiles	Check this box to display ceiling tiles placed in the drawing. Ceiling tiles are triangular surface entities that define the boundaries of the ceiling separating each floor of the building. Using this checkbox, you can select to either view or hide ceiling tiles. This functionality is useful to visualize where elevator shafts, auditoriums, or other building features are positioned. Ceiling tiles are used to explicitly specify ceilings if none exist in the drawing. Otherwise, ceilings are assumed to be everywhere.
Display Floor Tiles	Check this box to display floor tiles placed into the drawing. Floor tiles are simply ceiling tiles that have been placed on the floor below the current floor being displayed. For example, if Floor1 has had ceiling tiles specified for it and you adjust your view using the **View** > **Building Floor** commands to be Floor2, if the **Display Floor Tiles** checkbox is set the ceiling tiles positioned for Floor1 will be visible while you are viewing Floor2. This is primarily useful for report generation purposes.
Default Drawing Units Display	This dropdown list controls the default drawing units that will be used throughout the software modules to display lengths and distances. This only controls the settings for dialog boxes the first time you open them. Afterwards, the settings of the individual units selection controls within the dialog box are independently set. That is, the settings of each dialog box remain as you last left them independent of this flag.
Reset Display of Informational Windows	Some commands in LANPlanner Solo will display a dialog box containing helpful hints on using the command when it is accessed for the first time. These dialog windows, known as information windows, provide detailed information about the command. It is highly recommended that you carefully review each information window before continuing to use the corresponding command. Each information window contains a toggle that, when selected, will prevent the informational window from being displayed the next time you use the command. Once the toggle for a given dialog box has been set, it will not display again until you either reinstall the software program or use the **Reset Display of Informational Windows** functionality described here. The **Reset Display of Informational Windows** button, when selected, will reset all information windows for all LANPlanner Solo commands such that they will appear the next time a given command is activated. This command will also reset the displayed position and size of all LANPlanner Solo dialog boxes and windows to their defaults.

Format Building Menu

The **Format Building** menu contains commands for importing external drawing data and specifying the types of materials in the drawing that can affect wireless signal propagation. For more information on the proper way to format drawings, see Chapter 4.

This section of the manual provides a general description of each menu command on the Format Building menu. The Format Building menu is shown in Figure 2.9. For examples of using individual commands, see “Editing Partitions and RF Obstructions” on page 82.

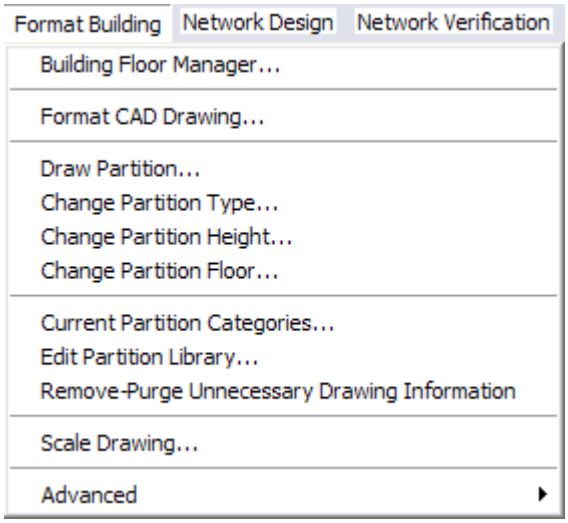


Figure 2.9: Format Building menu

Building Floor Manager	This command launches the **Building Floor Manager**, which is used to format, edit, and assemble building floors. The Building Floor Manager operates within the current Project Workspace and does not necessarily perform operations in the currently open drawing. In fact, accessing this menu command can force you to save the file you currently have open before proceeding. For details, see “Modeling a Building” on page 63. **NOTE** *The Building Floor Manager may be renamed as the Building Wizard in some versions.*
Format CAD Drawing	The **Format CAD Drawing** command is used to quickly and easily convert layers and entities in an AutoCAD drawing provided by a customer or end-user, into entities that are recognized by LANPlanner Solo for the purpose of RF propagation simulation. This command will process the layers of the currently open drawing. This same functionality is available through the Building Floor Manager which operates on the current workspace as opposed to the currently open drawing file. For details, see “Modeling a Building” on page 63. The process of formatting a CAD drawing is described in detail in “Importing an Unformatted File” on page 74.
Draw Partition	This command opens the **Partition Draw** dialog box that enables you to add new partitions to the drawing. See “Sketch Floor Plan” on page 69 for details.
Change Partition Type	This command allows you to change the type of RF attenuating material that is associated with a particular wall in the drawing. See “Convert Partition Type” on page 81 for details.

Change Partition Height	This command allows you to modify the height of processed partition
Change Partition Floor	This command allows you to move entities on the current floor to another floor.
Current Partition Categories	The **Current Partition Categories** command allows the user to define eight different types of obstructions being used in the current drawing. It also allows the user to change the color of the corresponding partition categories by selecting any color from the color drop down box next to the partition category. Categories available for use in drawings are defined in the partition library, which is editable using the **Format Building > Edit Partition Library** menu command. The Partition Library serves as a reference of obstruction information. Entities from the Partition Library are selected for use in LANPlanner Solo drawings using the Current Partition Categories menu command.
Edit Partition Library	The **Edit Partition Library** allows the user to add, remove, and edit different partition categories. Entries in the Partition Library do not affect partitions in the current drawing. To use a new partition type in the current drawing, create the partition type with the Edit Partition Library command, and then make it one of the current partition categories with the **Format Building > Current Partition Categories** command.
Remove-Purge Unnecessary Drawing Information	This command removes unnecessary Autocad information that is not pertinent to the main layers that will be processed into RF attenuating partitions.
Scale Drawing	The **Scale Drawing** command allows you to resize entities within the environment. You can scale the entire drawing (both formatted and unformatted), or only the formatted entities of one drawing or each entity-by-entity. You will be prompted to select two points in the drawing (by clicking with the mouse) and you can then enter the actual physical distance between the two locations you picked. The appropriate scaling will be applied so that the distance between the points within the drawing matches the value you enter. If your drawing contains measurement data, you should erase it before using the scale command.
Advanced	Described below, this command provides access to the **Building Manager**, **Drawing Limits**, **Layer**, **LineWeight**, **Prune Overlapping Partitions**, **Break/Ungroup Entities**.

Advanced Sub-menu

The **Advanced** sub-menu provides functionality for modifying different aspects of a drawing, drawing entities, and objects.

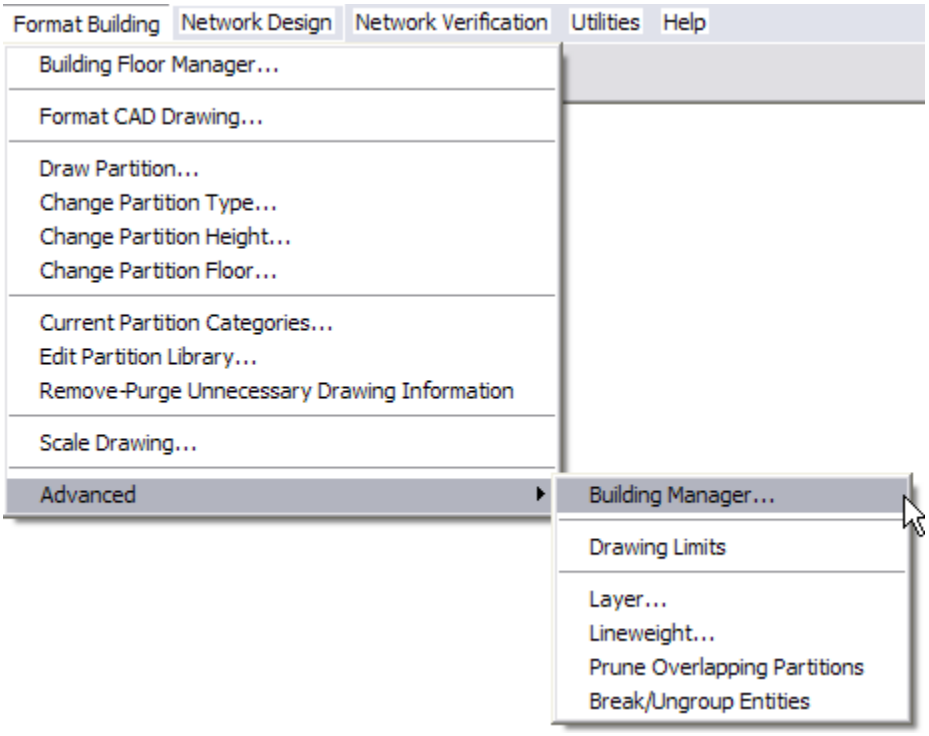


Figure 2.10: Advanced Sub-menu

Building Manager

The **Building Manager** dialog provides advanced functionality for managing and navigating floors in the current drawing. Most users will not require these features.

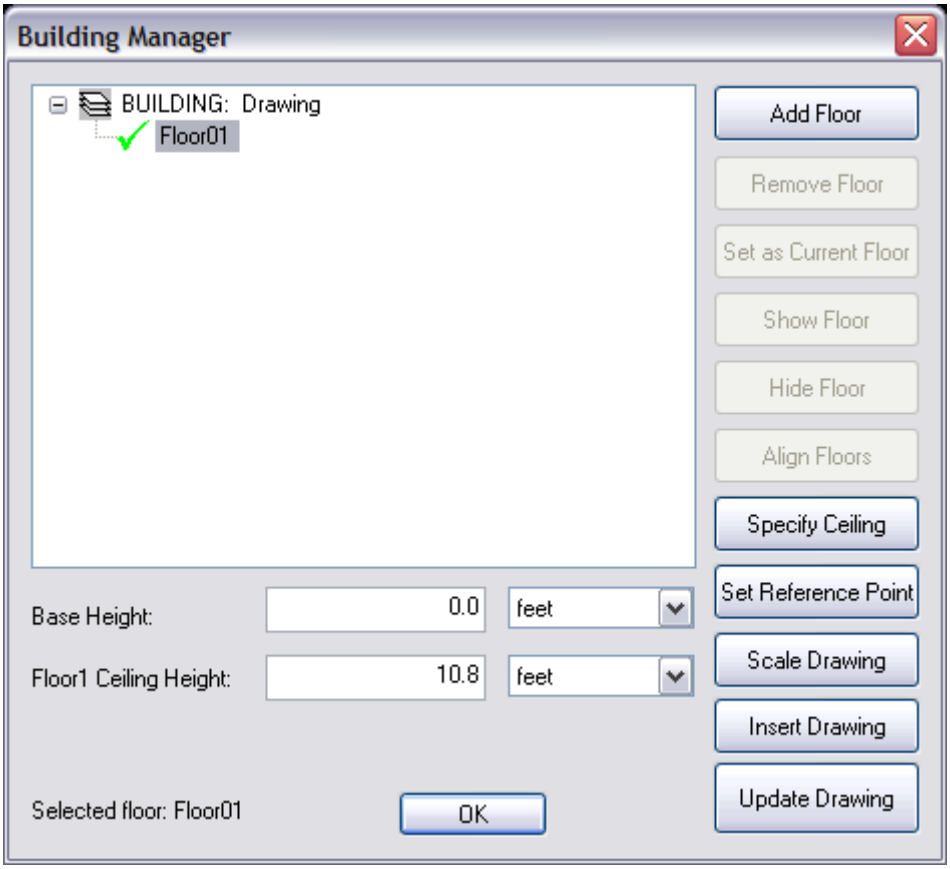


Figure 2.11: Building Manager dialog

Add Floor	Adds a new floor to the current drawing.
Remove Floor	Removes a selected floor from the current drawing.
Set as Current Floor	Sets a particular floor to the current floor and makes it visible.
Show Floor	Shows a selected floor.
Hide Floor	Hides a selected floor.
Align Floors	Aligns floors vertically if a building has multiple floors.
Specify Ceiling	Opens the **Ceiling Editor** dialog, which allows you to select the floor, and **Add Section of Ceiling**, or **Erase Section of Ceiling**.
Set Reference Point	If you are combining drawings of the same floor or are of two separate buildings, use **Set Reference Point** on each drawing separately to position the drawings properly relative to one another before combining them.

Scale Drawing	The **Scale Drawing** command allows you to resize entities within the environment. You can scale the entire drawing (both formatted and unformatted), or only the formatted entities of one drawing or each entity-by-entity. You will be prompted to select two points in the drawing (by clicking with the mouse) and you can then enter the actual physical distance between the two locations you picked. The appropriate scaling will be applied so that the distance between the points within the drawing matches the value you enter. If your drawing contains measurement data, you should erase it before using the **Scale Drawing** command.
Insert Drawing	Combines two separate drawings into one. The drawing you select will be inserted into the currently open drawing. This command is most often used to combine multiple floors of a building where each floor's information is contained in a separate drawing file into a single 3D model of the building, or to combine drawings of separate buildings.
Update Drawing	Purges the drawing files LANPlanner Solo uses during RF predictions and updates the drawing database after making modifications to the building model. Using this button is not necessary unless the drawing file has become corrupted.

Drawing Limits

The **Drawing Limits** command allows you to specify the limits of the drawing. Drawing limits are used by the software's AutoCAD graphics engine. Generally, they only need to be set when a drawing is received from an architect or customer that has extremely large limits far beyond the building(s) in the design. Grossly oversized limits can make it hard to perform some LANPlanner Solo functions, such as scaling. The **Drawing Limits** command allows you to set the drawing limits to be closer to the actual building or buildings in your design.

Layer Properties Manager

The **Layer Properties Manager** (Figure 2.12 below) allows you to directly manipulate the drawing layers on which walls and other entities are stored. It is almost never necessary to directly manipulate layers, but some advanced users, especially those with CAD experience, may wish to do so. A layer is a grouping of one or more drawing entities. Layers themselves have properties. For example, each layer has a unique name by which it is referenced (e.g., 'FLOOR1'). Layers may be invisible (in which case the drawing entities that are part of those layers are hidden from view) or visible. Layers have a default color associated with them such that all new graphical entities (e.g., lines) placed on a given layer assumes the default color of the layer.

LANPlanner Solo uses layers to organize and manage physical obstructions such as walls. Each LANPlanner Solo partition type is stored on its own layer. Use the **Format Building** > **Current Partition Categories** command to view the partition types, and the layers they are stored on. Note that the objects for each floor are stored on a separate layer, so that the "windows" on the first three floors of a drawing might for example be stored on MPART1, MPART2 and MPART3 respectively.

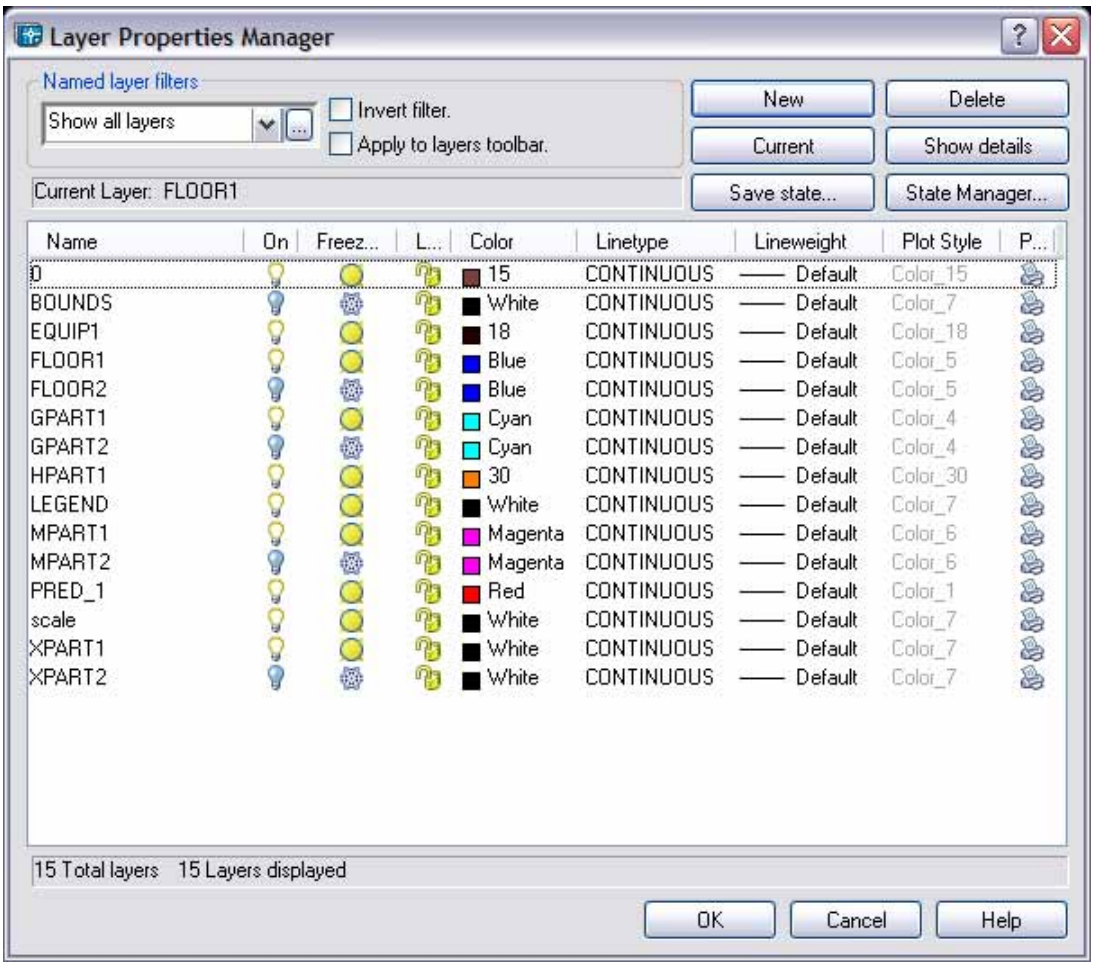

Layer Properties Manager
Named layer filters
Show all layers
Invert filter.
Apply to layers toolbar.
New
Delete
Current
Show details
Current Layer: FLOOR1
Save state...
State Manager...
Name | On | Freez... | L... | Color | Linetype | Lineweight | Plot Style | P...
0 | 15 | CONTINUOUS | Default | Color_15
BOUNDS | White | CONTINUOUS | Default | Color_7
EQUIP1 | 18 | CONTINUOUS | Default | Color_18
FLOOR1 | Blue | CONTINUOUS | Default | Color_5
FLOOR2 | Blue | CONTINUOUS | Default | Color_5
GPART1 | Cyan | CONTINUOUS | Default | Color_4
GPART2 | Cyan | CONTINUOUS | Default | Color_4
HPART1 | 30 | CONTINUOUS | Default | Color_30
LEGEND | White | CONTINUOUS | Default | Color_7
MPART1 | Magenta | CONTINUOUS | Default | Color_6
MPART2 | Magenta | CONTINUOUS | Default | Color_6
PRED_1 | Red | CONTINUOUS | Default | Color_1
scale | White | CONTINUOUS | Default | Color_7
XPART1 | White | CONTINUOUS | Default | Color_7
XPART2 | White | CONTINUOUS | Default | Color_7
15 Total layers 15 Layers displayed
OK
Cancel
Help

Figure 2.12: Layer Properties Manager

When layers are visible, you can make changes to entities on the layer. Hidden layers remain stored in the drawing file, but the objects on hidden layers are not accessible for selection. Layers that are hidden are generally unaffected by your actions. Certain commands in the software will access and alter entities that exist on hidden layers. For example, if you remove an access point from a drawing using the **Network Design** > **Edit/Remove**

access point command, the access point will be removed from the drawing regardless of which layer the access point resides upon.

However, if you select entities using the **Format Building** > **Change Partition Type** command, entities on hidden layers are not visible and therefore cannot be selected and converted into a different partition category. Objects that exist on a layer can be moved to other layers and can have their properties controlled by the settings of the layer. For example, an entity moved to layer “FLOOR1” assumes the default properties of layer “FLOOR1”, such as color and visibility. If you move an entity to a layer that is hidden, the entity will become hidden.

LANPlanner Solo drawings use a structured layer scheme for organizing building floor plans in a database that can be used for performing complex predictions, optimizations and measurements. Depending on the complexity of the objects that you wish to incorporate, the software may have a different number of layers for each formatted floor. You can manipulate the different properties of the layer by clicking the different symbols in the **Layer Properties Manager** dialog box. See the figure below:

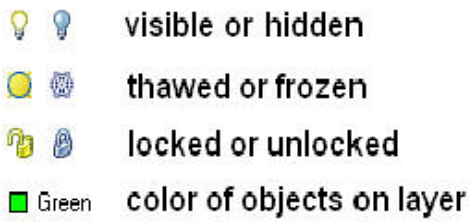


Figure 2.13: Layer Properties symbols

Manually creating new layers may be beneficial if you have additional information you would like to incorporate into a drawing but which you do not want associated directly with the entities on any existing layer. The **Layer Properties Manager** also allows you to create new layers by using the **New** button in the **Layer Properties Manager** dialog box. You can also select a particular layer and make it the current layer by clicking the **Current** button.

Lineweight Settings

Lineweight Settings are useful for increasing the thickness with which lines are drawn in 2D Wireframe and other wireframe views. It is not common to use the 2D Wireframe view; the **Flat Shaded**, **Edges On** view is more commonly used, as it has filled in walls that provide a more realistic 3D appearance. However, when in 2D Wireframe mode, thicker lines can help make the walls of a building stand out over a bitmap background.

To use typical settings for displaying lineweights, check the **Display Lineweights** checkbox in the **Lineweight Settings** dialog box, and choose 0.30mm from the **Default** combo box. Make sure that your Lineweights list box has **ByLayer** selected. Click **OK** in the **Lineweight Settings** dialog box to close it and display the increased lineweights. Note that the lineweights will only be visible in wireframe modes. Lineweights do not affect RF propagation simulation.

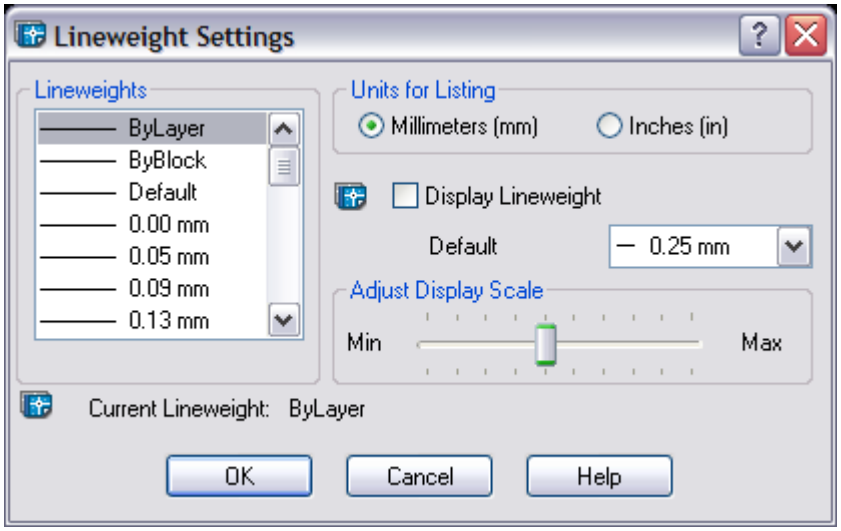


Figure 2.14: Lineweight Settings dialog

Prune Overlapping Partitions

This command process the design removing overlapping partitions to prevent double/triple attenuation of partitions. Overlapping partitions are lines that get drawn directly on top of each other. Because LANPlanner Solo's prediction engine treats each line as a wall, the effect of overlapping lines is that two walls are recognized where there should only be one. Prune overlapping partitions removes the duplicate lines so long as they are the same partition type and drawn with the same start and end point.

Break/Ungroup Entities

This command ungroups individually selected grouped blocks in the current viewport. This means that any grouped blocks that are currently being displayed will be separated (ungrouped) if you select them.

Network Design Menu

The **Network Design** menu encapsulates the prediction capability of LANPlanner Solo. With LANPlanner Solo, you have a comprehensive wireless communication system analysis package that helps you carry out frequency planning, capacity planning, signal strength evaluation, signal-to-interference evaluation, and throughput evaluation. After you use LANPlanner Solo to place access points and sensors, predictions may be displayed in a variety of ways to inform you how such a system will perform. For more detailed information on the commands in this menu and how to use them, see Chapter 5.

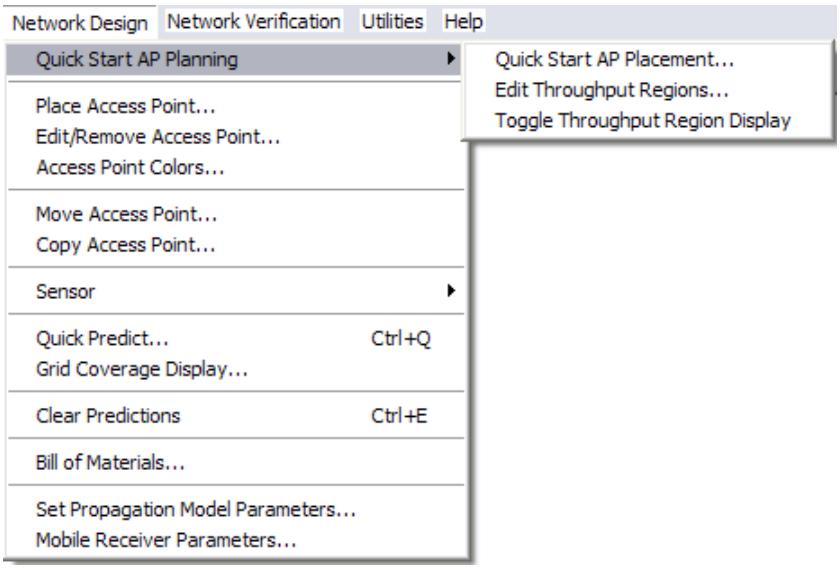


Figure 2.15: Network Design menu

Quick Start AP Planning	This command opens a fly-out menu that allows you to have the software automatically place access points, or throughput requirement regions used by the Quick Start AP Placement feature or the network utilization feature. The access points that you choose from are automatically placed in the regions that require connectivity. For details about the **Quick Start AP Placement** command, see “Quick Start Access Point Placement” on page 108. For details about the **Edit Throughput Regions** command, see “Specifying Requirement Regions” on page 111. The **Toggle Throughput Region Display** command toggles throughput regions in the drawing on or off.
Place Access Point	This command prompts you with a list of pre-configured access points that you may place in your drawing. To place an access point, **double click** your left mouse button on an access point from the list. Your mouse cursor will turn into an access point that will move as you move your mouse. Left click in the drawing to position the access point at a fixed location. You may continue to left click to place more access points. Press the **ESC** key to exit place access point mode and return to the list of pre-configured access points. See “Access Point Placement” on page 105 for details.
Edit/Remove Access Point	This command allows you to edit, remove, move, or copy any access point in the drawing. See “Edit/Remove Access Point” on page 121 for details.
Access Point Colors	This command allows you to override the default colors of access points. It will color code access points based on floor number, air interface, channel set, active channel, power, antenna type, cable type, or connector type. You may specify the colors by double clicking on the label in the dialog box that you want to change. See “Access Point Colors” on page 143 for details.

Move Access Point	This command allows you to change the location of an access point. Select the access point you wish to move from the list and click the Move button. The mouse will then show the access point you selected and will move as you move your mouse around the floor. Left click to place the access point in the new location. See “Move Access Point” on page 144 for details.
Copy Access Point	This command allows you to place access points that have the same properties as another access point in your drawing by selecting an access point and then selecting the location where you would like the copy to be placed. You may also multi-select access points to copy more than one at a time. The software will automatically give the new access points unique names. See “Copy Access Point” on page 145 for details.
Sensor	This command opens a fly-out menu for placing, editing/removing, moving, and copying sensors. See “Managing Sensors” on page 146 for details.
Quick Predict	This command opens up the Quick Predict dialog box. The Quick Predict dialog box is where you may perform a variety of coverage predictions. From this dialog you can select from the following types of predictions: • Channel Planning • Instant Point Mode • Coverage Predictions • Access Point Positioning • Antenna Reorientation See “Running Quick Prediction” on page 151 for details.
Grid Coverage Display	This command opens the **Grid Coverage Display** dialog box. From this dialog box, you can select the composite coverage prediction results you wish to display. See “Displaying Grid Coverage Results” on page 173 for details.
Clear Predictions	This command erases prediction results for all access points on all floors throughout the drawing.
Bill of Materials	This command provides you with a list of equipment and cost currently placed in the drawing. See “Generating a Bill of Materials” on page 182 for details.
Set Propagation Model Parameters	This command provides you with a dialog box that allows the modification of partition labels and values, path loss parameters, and attenuation parameters. See “Setting Propagation Model Parameters” on page 183 for details.
Mobile Receiver Parameters	This command opens a dialog box allowing you to configure the receiver channel set, the mobile transmitting power, the mobile antenna gain, body loss margin, mobile noise figure and the receivers’ height above the floor. See “Setting Mobile Receiver Parameters” on page 187 for details.

Network Verification Menu

The **Network Verification** menu provides the ability to collect site-survey measurement data and to use that measurement data to fine tune LANPlanner Solo's prediction engine and environment parameters. Network Verification is discussed in more detail in Chapter 6. The options under the Network Verification menu are briefly described below.

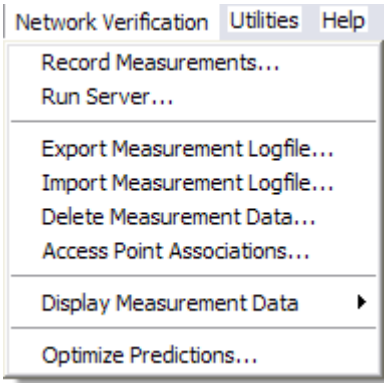


Figure 2.16: Network Verification menu

Record Measurements	This command will launch a client application that will allow you to collect measurement information about your network from a WLAN (Wireless LAN) card. LANPlanner Solo may be installed on any PC and the measurement client will be accessible as long as you have a valid license. See "Stand-alone Measurements" on page 192 for details.
Run Server	This command will launch the Measurement Server. The Measurement Server allows connections from measurement clients. See "Server-coupled Measurements" on page 196 for details.
Export Measurement Logfile	This command allows you to export measurement data embedded within the drawing to an ASCII logfile. See "Exporting Measurement Logfiles" on page 199 for details.
Import Measurement Logfile	This command allows you to import an ASCII measurement logfile created by LANPlanner Solo. See "Importing Measurement Logfiles" on page 200 for details.
Delete Measurement Data	This command allows you to remove measurement data from the current drawing. Your measurement data logfile, however, will still remain on your hard drive unless you select the option to "Erase Logfile" on the Measurement Run Delete dialog box that prompts you for the measurement run you would like to remove. See "Deleting Measurement Data" on page 201 for details.
Access Point Associations	Allows you to associate measurement points with the access point(s) that were associated with while taking measurements.
Display Measurement Data	This submenu includes commands to display or hide both graphical and text markers for measurement data in the drawing. See "Displaying Measurement Data" on page 202 for details.
Optimize Predictions	This is an 'all-in-one' optimization function that takes you through the steps required for parameter tuning. See "Optimizing Predictions" on page 207 for details.

Utilities Menu

The **Utilities** menu provides access to commands that are useful through the entire software package. The commands allow you to do such things as:

- Enter project information
- Alter the drawing legend
- Create text labels
- Measure distances between drawing points mouse cursor

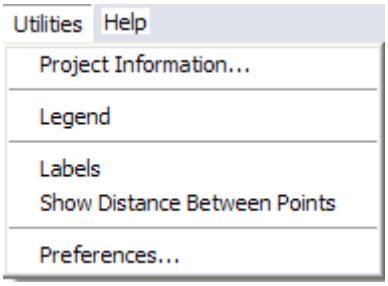


Figure 2.17: Utilities menu

Project Information	This command opens a tabbed dialog that will allow you to view and edit information about the current project workspace.
Legend	This command opens a dialog box that allows you to configure the drawing legend and title block. With this dialog box, you can change the text in the title block, alter the size and position of the legend relative to the drawing, and toggle what information is shown in the legend.
Labels	This command lets you add text labels with your choice of font, formatting, and color to the drawing. When you place a label, you first use the mouse to identify where the label should go on the screen. This involves identifying the rectangular region bounding the label; the label text will wrap within the text box. The label editor will then appear enabling you to enter text of various fonts, styles, and colors. Once a label has been placed, click on it and drag the mouse to move the label to a different location. To edit a label, first click on the label and then type the command “mtedit” in the command window and press enter. The label edit will reappear and allow you to change the label’s text.
Show Distance Between Points	This command prompts the user to select points in a drawing; LANPlanner Solo draws temporary line segments between consecutive points. While the mouse cursor is moved around, a tool tip displays the sum of the lengths of the line segments. Pressing **ESC** once will cancel the current set of lines, and pressing **ESC** again will terminate the command. The distance is based on the current scale of the drawing. See “Rescale Floor” on page 80 for details.
Preferences	This command brings up an **Options** dialog box that allows you to configure various LANPlanner Solo settings with respect to File, Display, Save, Plotting, User preferences, Drafting, and Selection.

Preferences Dialog

LANPlanner Solo offers many different configuration preferences for your convenience. These preferences allow you to configure the file paths, printers, autosave, pointer devices, fonts, colors, and many other settings. This section describes each of the tabs in the **Preferences** dialog.

Preferences - Files

The **Files** tab in the **Preferences** dialog box presents the options shown below. Most of the settings are determined during installation, or are derived from your computer's Windows profile (under Windows 2000/XP), and do not need to be changed under normal circumstances.

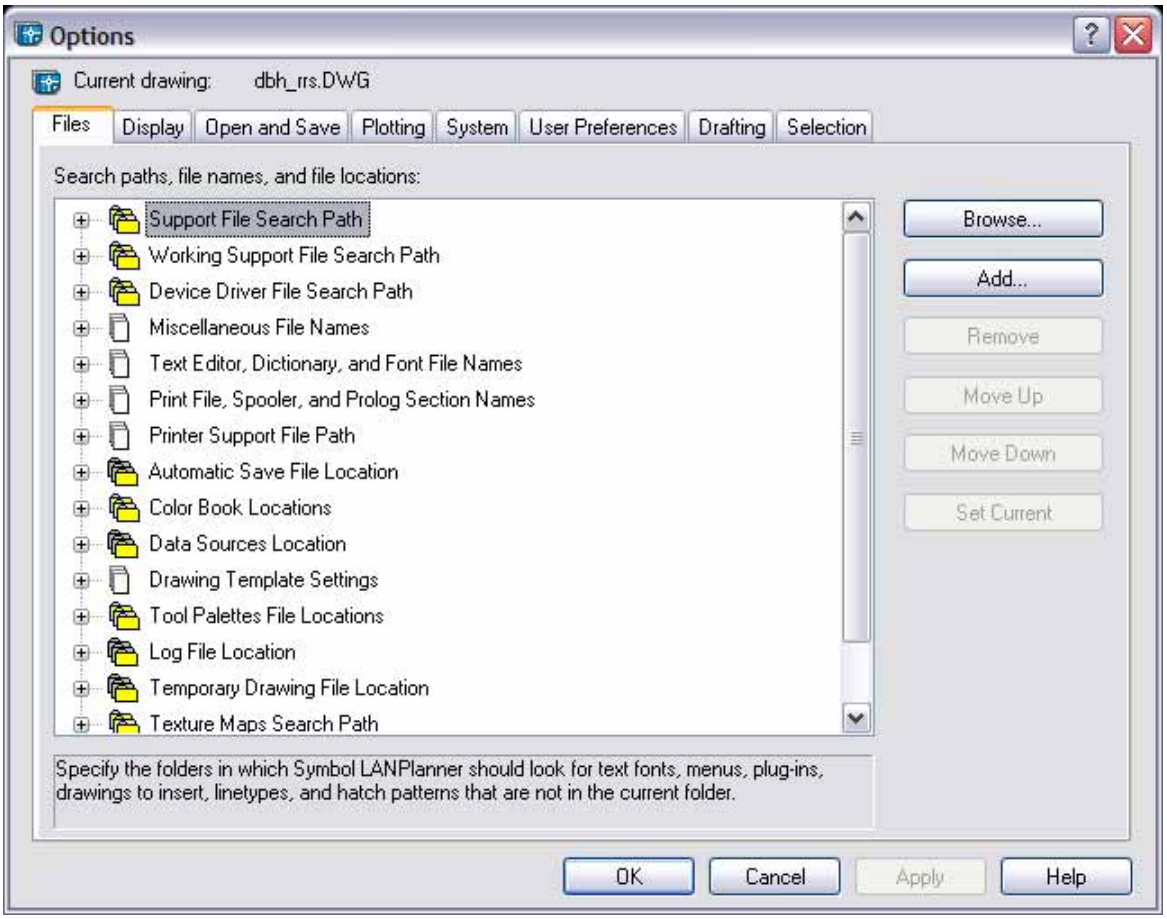


Figure 2.18: Preferences - Files dialog

Preferences - Display

This tab, controls various options related to how the drawing is rendered to the screen. For example, the **Colors** button allows you to customize the user interface colors to suit your personal preferences.

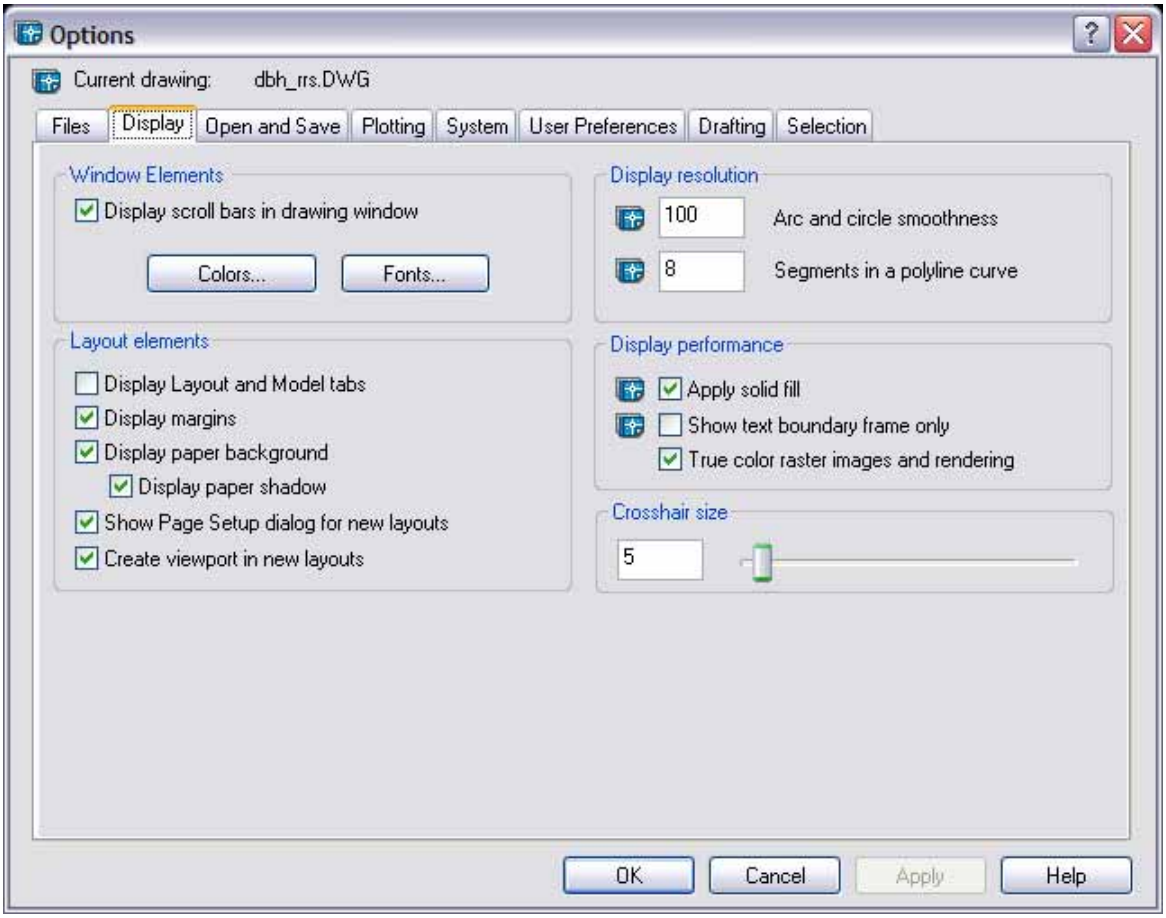


Figure 2.19: Preferences - Display dialog

- **Display scroll bars in drawing window -** Enables horizontal and vertical scrollbars in drawing window.
- **Colors** - Figure 2.20 below shows the **Color Options** dialog box which allows you to customize the colors used in the drawing. For example, by selecting the “Model tab background” entry in the **Window Element** pull down list, and then selecting a color in the **Color** pull down list, you may change the background color of your drawing window. Typically either a black or white background gives the best results.

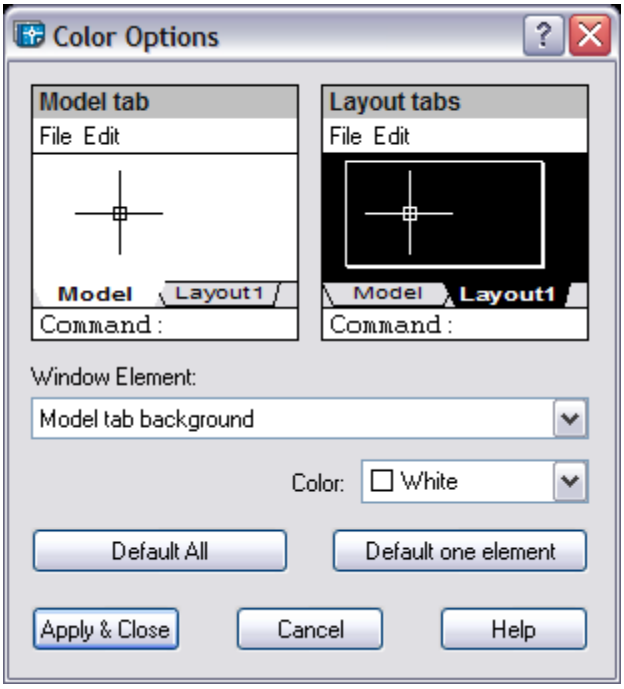


Figure 2.20: Display - Color Options

- **Fonts** - The dialog in Figure 2.21 below allows you to choose a font for the **Command Line** pane and the **Session History** window. This only affects the appearance of text within the lower command prompt area.

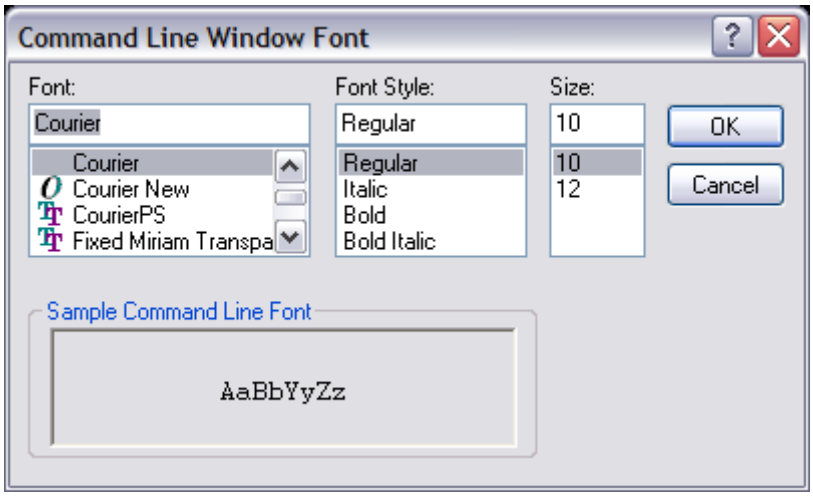


Figure 2.21: Display - Fonts

Preferences - Open and Save

Preferences related to how LANPlanner Solo opens and saves files are contained in the **Open** and **Save** tab under the **Options** dialog box in Figure 2.22 below. Users will typically want to keep the "**Save as:**" preference set to "LANPlanner Solo 2004 drawing". This option is the default; however, users can override this in the "**Save As…**" dialog box available from the **File** menu.

The "**Maintain a log file**" checkbox allows a user to capture the messages from the command line window. The log file is written to the main program directory and the filename typically starts with the name of the drawing and ends with a ".log" extension. It is important to note that each time you run the software it will append new information onto the log file, meaning that it will grow larger over time.

External references, or Xrefs, are links within a CAD drawing file to a separate, external drawing file. Xrefs are typically only a concern when importing CAD drawings. The default settings should be sufficient for most applications.

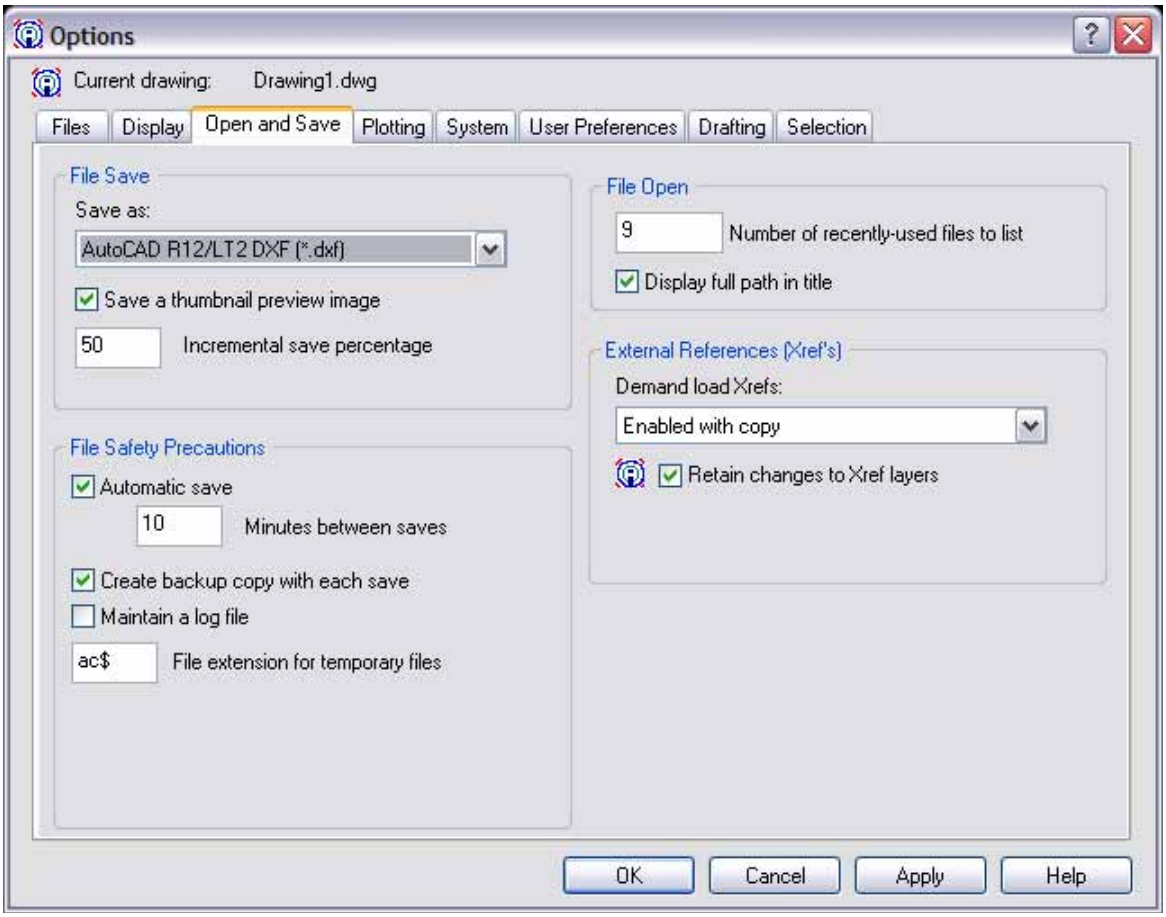


Figure 2.22: Preferences - Open and Save dialog

Preferences - Plotting

This tab controls the default settings for the printing and plotting subsystem. Use this functionality to control the way in which your designs are printed.

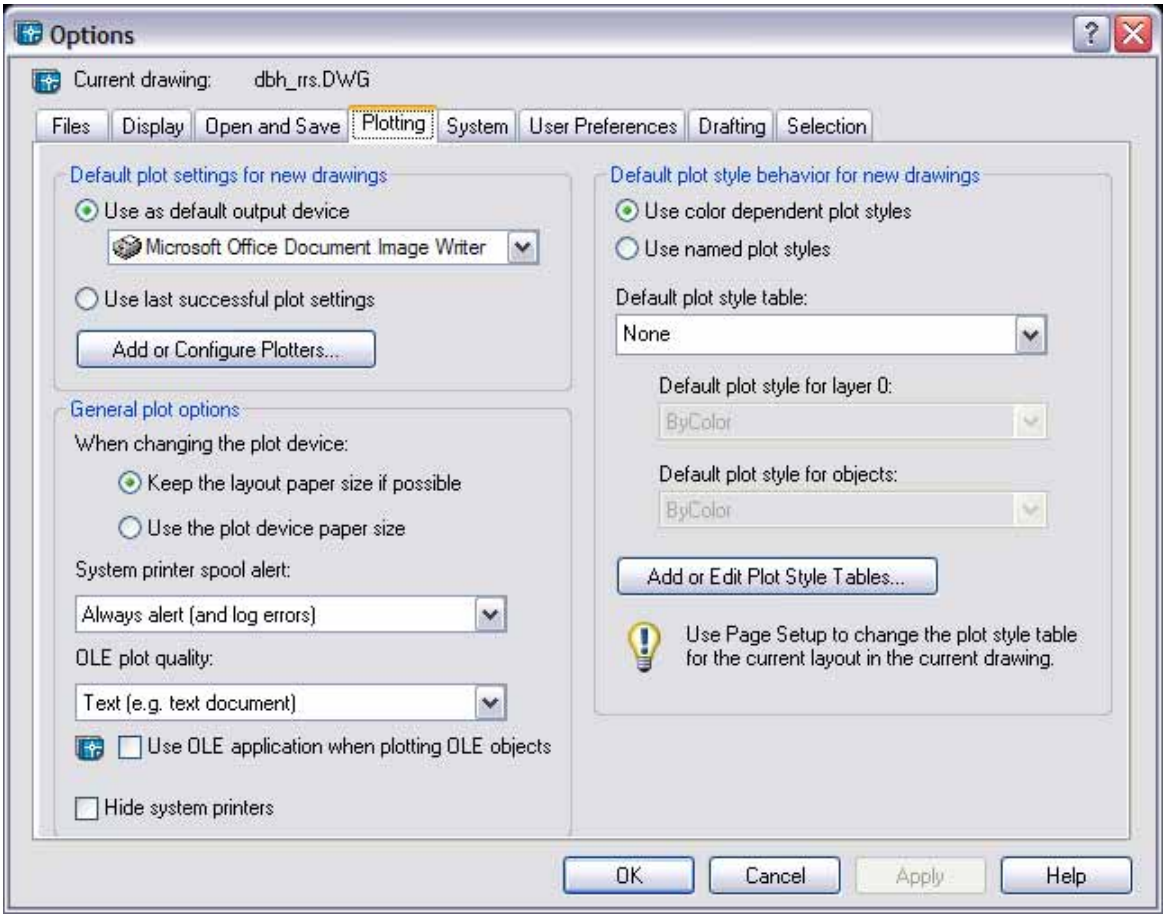


Figure 2.23: Preferences - Plotting tab

Preferences - System

This tab enables you to adjust such properties as whether or not the software will generate an audible alert on errors, and to configure access to system pointing devices other than the Windows system mouse (example, a CAD drawing tablet).

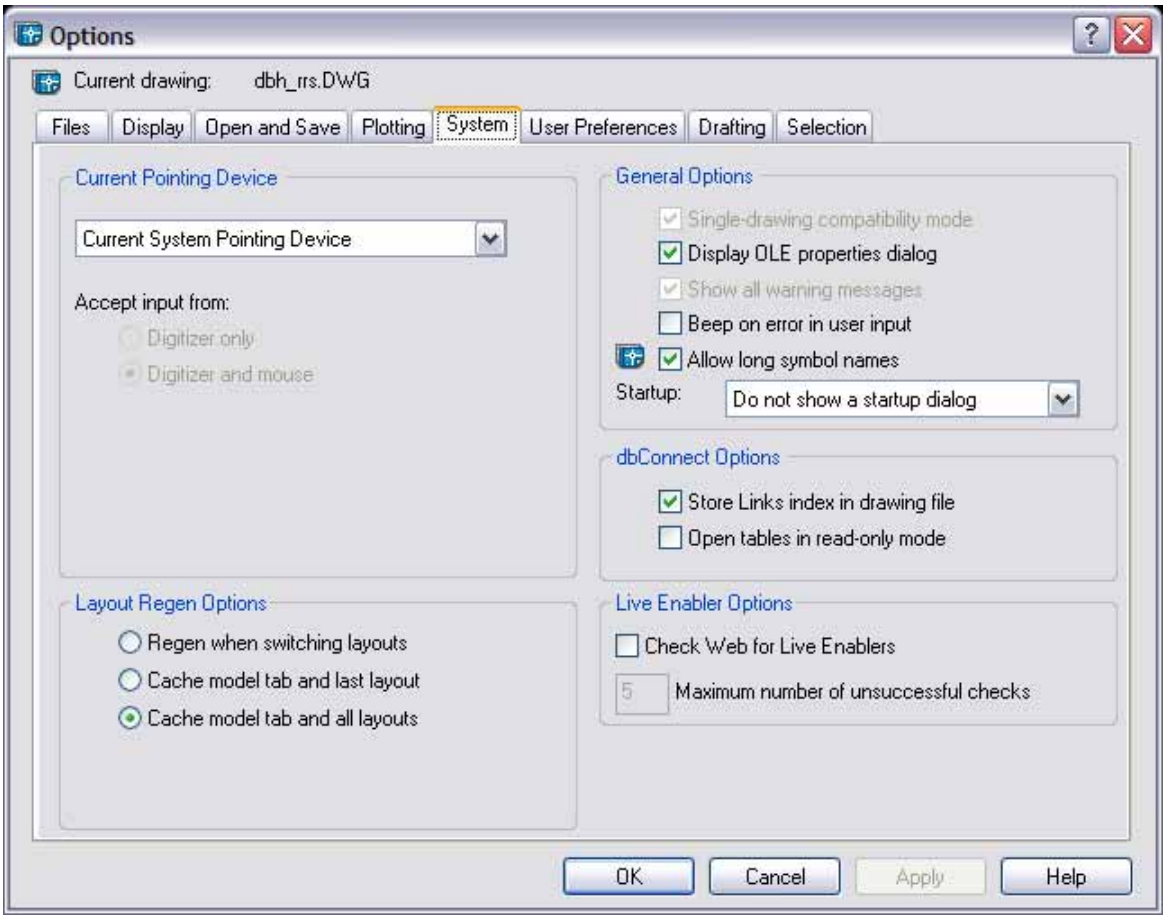


Figure 2.24: Preferences - System dialog

Preferences - User Preferences

The **User Preferences** tab contains a number of settings that are primarily of interest to users familiar with AutoCAD. The default settings for these values are generally the most beneficial.

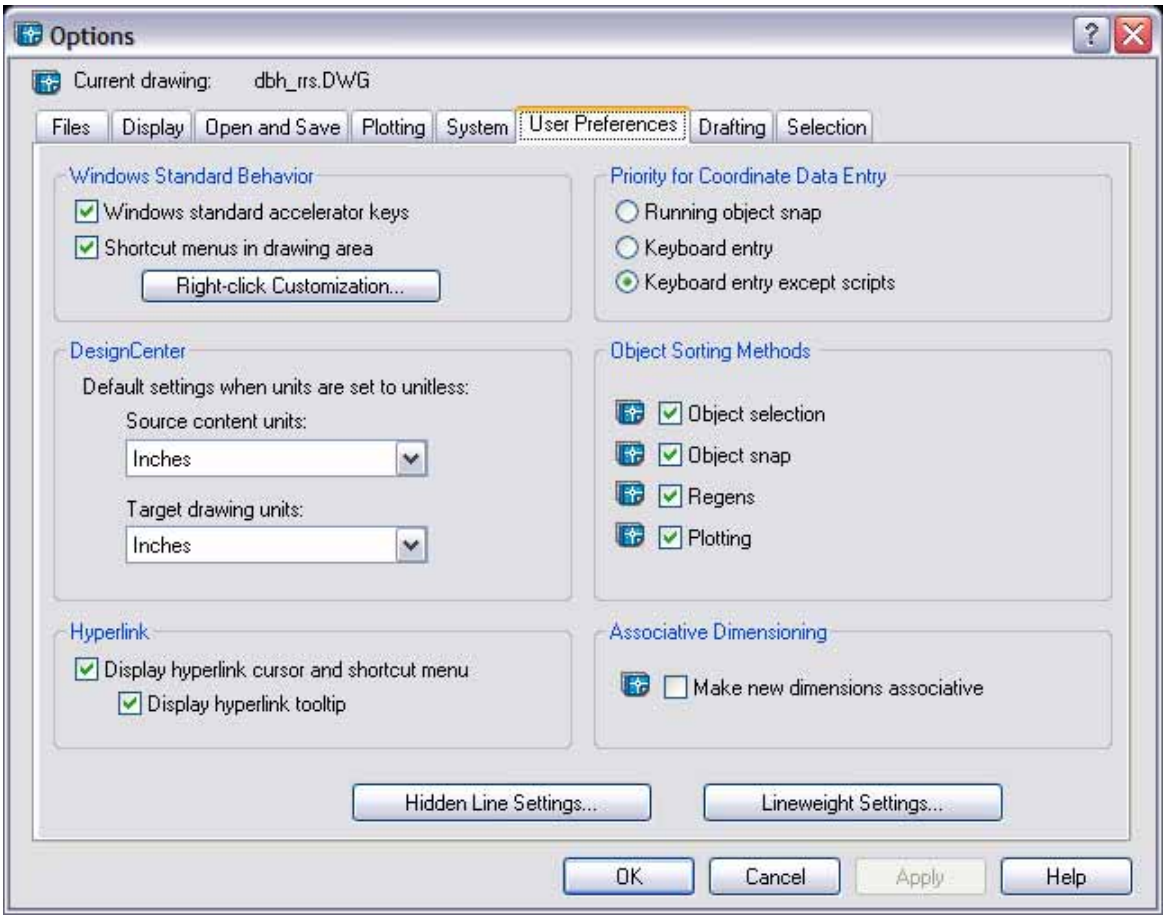


Figure 2.25: Preferences - User Preferences dialog

- **Windows Standard Behavior -** Enables you to select whether to use the standard Windows accelerator keys (example, Control-C performs a copy operation, Control-V performs a paste operation) or the right-click popup menu. Some users who are very familiar with CAD programs such as AutoCAD prefer to map the right mouse button to perform a carriage return operation. In LANPlanner Solo, a carriage return will repeat the last command performed, which is a standard CAD program behavior. By mapping the right mouse button to the carriage return operation, you may activate the previous command by simply right-clicking with your mouse.
- When prompted to select a point by LANPlanner Solo, you may type an exact coordinate in the command prompt area (e.g., by typing “0.1,2.3,5.2” you are referring to the point within the drawing at x-coordinate 0.1, y-coordinate 2.3, and z-coordinate 5.2). If **Object Snap** is active, however, coordinates you enter on the keyboard may “snap” to a different location. For example, if **Object Snap** is set to snap to entity end points, and you type a coordinate on the keyboard, if the coordinate is near the end point of a drawing entity, the actual coordinate the software will use is that of the end point of the drawing entity since **Object Snap** is active. To disable this, select the “Keyboard entry” option in the **Priority for Coordinate Data Entry** window.
- **Object Sorting Methods** - Enables you to customize the order in which operations are performed on drawing entities. If any of the check boxes are set, the corresponding operation is performed on drawing entities by the order in which they were created. If not set, the corresponding operation is performed on drawing entities

randomly. For example, if the **Redraw** check box is set, and you select the **View** > **Redraw** command from the main program menu, drawing entities are redrawn on the screen in the order in which they were created (example, the first drawing entity is redrawn first). Otherwise, the entities will be redrawn randomly. Generally, you should notice no change in operation by activating or deactivating **Object Sorting**. Except in extremely specialized applications (example, you wish to have certain drawing entities plotted prior to others), this functionality should not affect your work in LANPlanner Solo.

- **Lineweight Settings** - Enables you to activate, deactivate, or adjust the settings for the display of lineweights in the software. When in the 2D wireframe shade mode (accessed through the **View** > **Shade** menu), lineweight settings effect the perceived thickness of line entities. For example, you may use the lineweight settings to make all entities representing the outer wall of your building to appear thicker than the interior walls. This only affects the way lines are displayed on the screen and has no impact on the way drawing entities are managed.
- **Hyperlink** - Enables you to adjust the way the mouse cursor responds when it encounters a hyperlink within LANPlanner Solo. For example, when the mouse cursor passes over a hyperlink, the cursor transforms into a small hand to visually identify the hyperlink

Preferences - Drafting

The options in the **Drafting** tab are useful if LANPlanner Solo is regularly used on a computer with a non-standard display resolution. Related options are also under the **Selection** tab.

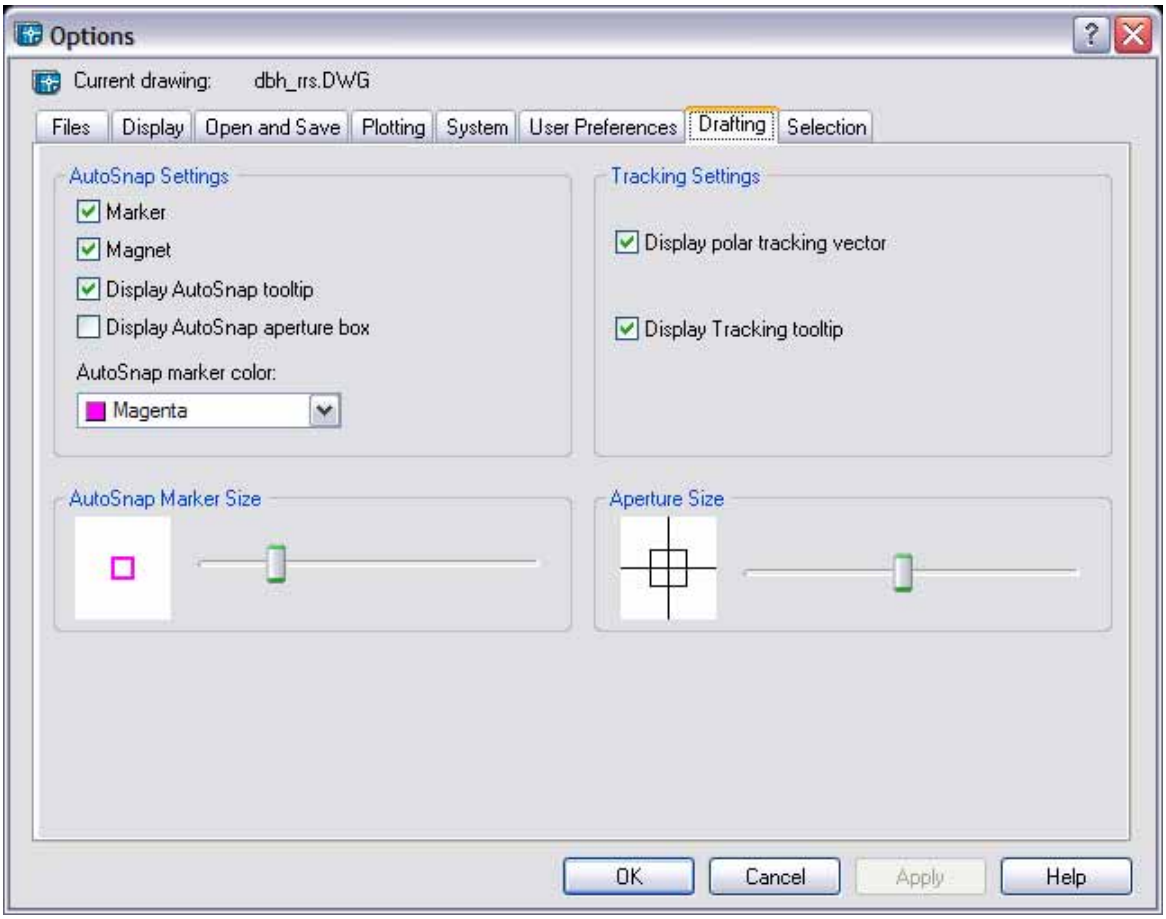


Figure 2.26: Preferences - Drafting dialog

- **AutoSnap Marker** - Indicator displayed at a **snap** point when the **OSNAP** option is turned on, but can be difficult to see at high display resolutions.
- **Aperture Size** - The region that the software will search for objects when you are making a selection. This allows a certain amount of inaccuracy in positioning the mouse cursor for a selection, but can be counterproductive on a low-resolution screen where the software might find another object in the aperture first.

Preferences - Selection

The **Selection** tab provides options related to selecting objects in a drawing. These options are quite useful when using **Format Building** to reformat an existing CAD drawing.

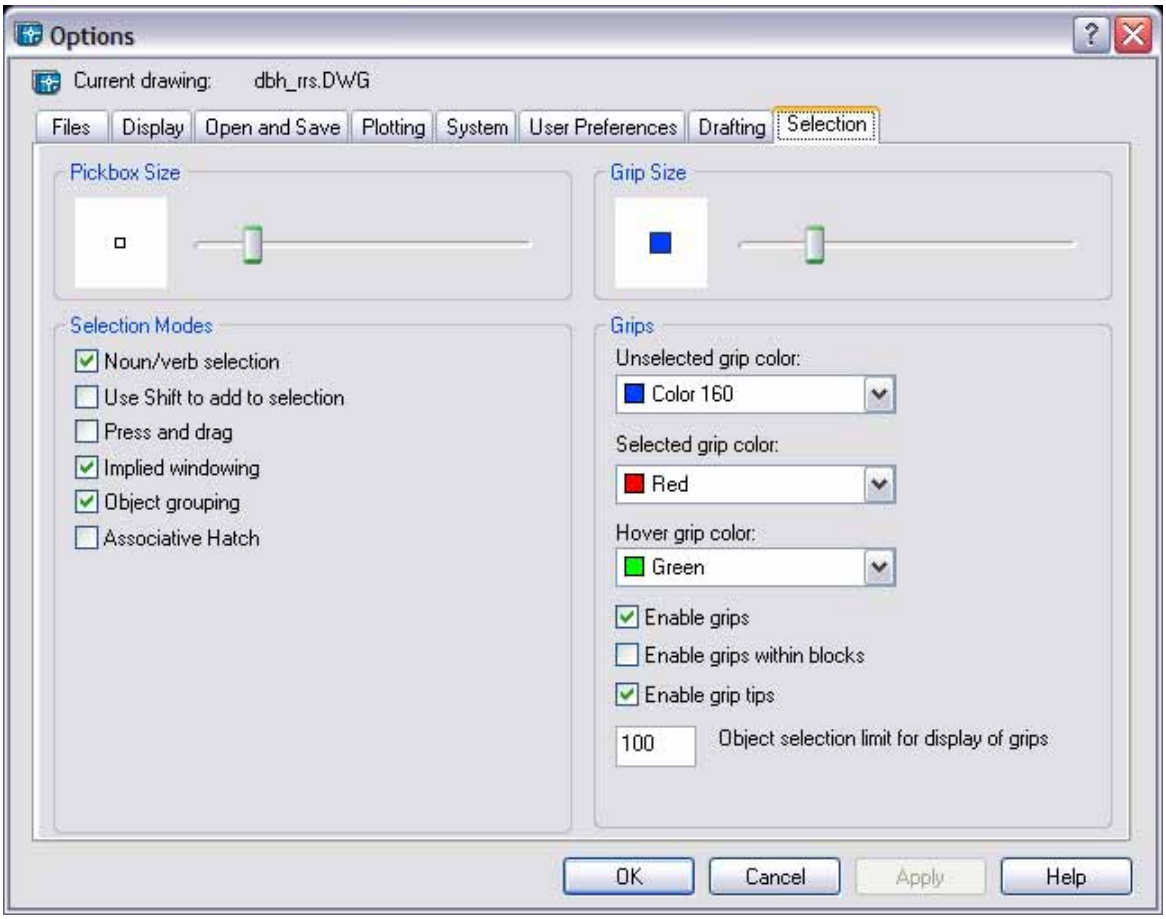


Figure 2.27: Preferences - Selection dialog

- **Noun/Verb Selection -** To specify objects for a command to operate upon, you can either make the selection and invoke the command, or invoke the command and then make the selection. The former is considered a noun/verb selection (the selection occurs before specifying the action) and is enabled by this checkbox.
- **Use Shift to add to selection -** Checking this box forces LANPlanner Solo to use the typical Windows selection semantics. The default is to add to the selection when you click on a different object, and to remove the object from the selection set when shift is held down.
- **Press and Drag -** LANPlanner Solo usually requires you to define a selection rectangle with two clicks, each at diagonally opposite corners. Enabling this checkbox allows you to click and drag to sweep out rectangles.
- **Implied Windowing -** When a point is selected outside of an object, start a selection rectangle (or window).

- **Object Grouping -** Checking this box implies that if one object in a group is selected, the rest of the group should also be selected.
- **Associative Hatch -** This option is generally not used with LANPlanner Solo drawings, which usually do not make use of associative hatches. This option determines which objects are selected when you select an associative hatch. If this option is selected, boundary objects are also selected when you select an associative hatch.
- **Grips -** The boxes shown on objects once they are selected. They are so named because they permit you to drag and reshape or resize the object once selected. The options are straightforward with the exception of the "enable grips within blocks" checkbox, which specifies whether individual objects within a block have visible grips, or whether a set of grips is shown for the block as a whole.

Help Menu

The **Help** menu provides valuable information about every aspect of LANPlanner Solo and is briefly discussed below.

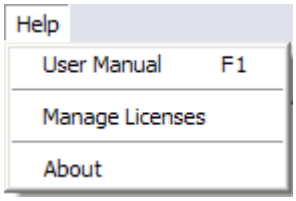


Figure 2.28: Help menu

User Manual F1	This command will launch the LANPlanner Solo User's Guide.
Manage Licenses	Allows the management of your LANPlanner Solo license. See "Managing Software Licenses" on page 50, below.
About	This command opens the About LANPlanner Solo screen, which shows information about the software.

Managing Software Licenses

You can use the **Help > Manage License** menu option to do many useful tasks related to managing your software license. Use this menu command to: register LANPlanner Solo, verify license status, or add new licenses.

Verify License Status

If you wish to know if you have a valid license and if so, how much time is left on it, then you can use the command **Help** > **Manage Licenses**.

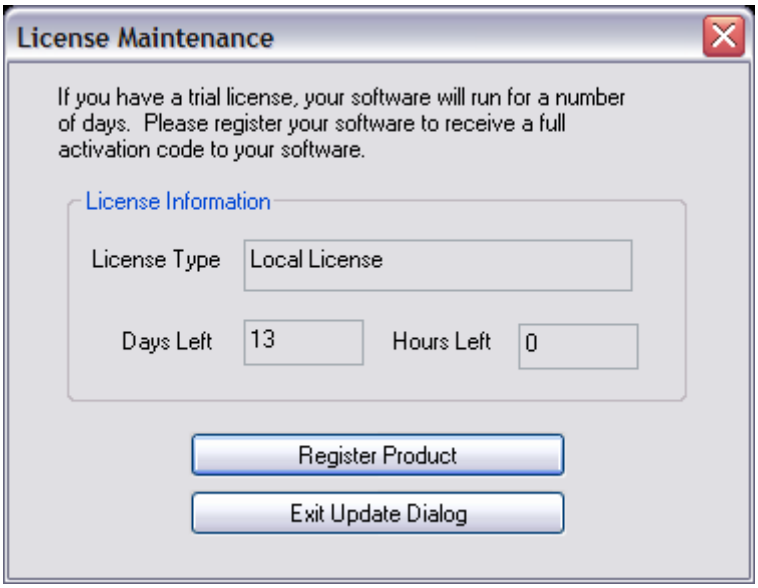

License Maintenance
If you have a trial license, your software will run for a number of days. Please register your software to receive a full activation code to your software.
License Information
License Type
Local License
Days Left
13
Hours Left
0
Register Product
Exit Update Dialog

Figure 2.29: License Maintenance

- **License Type -** Reports if you have a **Trial License** or a **Local License**. Local and Trial licenses are stored on the machine that the software is running on.
- **Days Left/Hours Left** - The amount of days/hours remaining on the current license LANPlanner Solo license.
- **Register Product** - See “Registering LANPlanner Solo and Updating Licenses” on page 51, below.

Registering LANPlanner Solo and Updating Licenses

To add a new license or to update an existing license, you should click on the **Register Product** button located on the **License Maintenance** dialog box to open the **Update License** dialog:

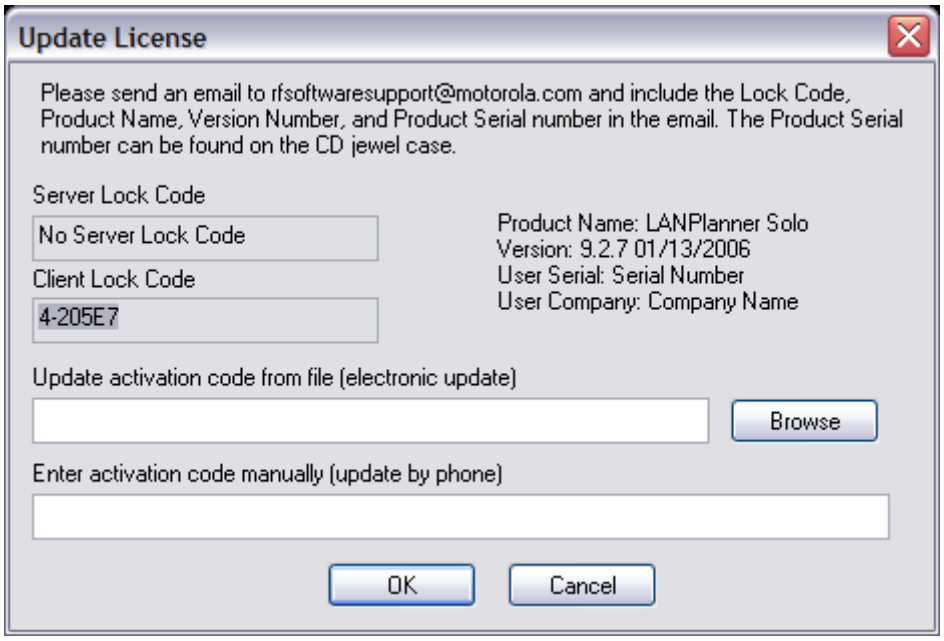

Update License
Please send an email to rfsoftwaresupport@motorola.com and include the Lock Code, Product Name, Version Number, and Product Serial number in the email. The Product Serial number can be found on the CD jewel case.
Server Lock Code
No Server Lock Code
Client Lock Code
4-205E7
Product Name: LANPlanner Solo
Version: 9.2.7 01/13/2006
User Serial: Serial Number
User Company: Company Name
Update activation code from file (electronic update)
Browse
Enter activation code manually (update by phone)
OK
Cancel

Figure 2.30: Update License

To register a new license you need to contact rfsoftwaresupport@motorola.com and include the following information: client lock code, product name, product version, serial number, and the server lock code. You will receive a file by E-mail. Save this file to your hard drive and use the **Browse** button to locate the file. You can then click the **OK** button to add the licenses.

3 Managing the Project Workspace

Introduction

When LANPlanner Solo is installed, a project workspace directory structure is automatically placed on your PC to help organize and manage your work. You do not need to be aware of this directory during normal use, but it is important to understand how LANPlanner Solo operates on files within a project workspace. This section provides information regarding project workspaces and how and when workspace specific files are created automatically.

NOTE

LANPlanner Solo always works within the concept of a project workspace, regardless of what individual file is currently open in the software.

Creating a New Project

Since LANPlanner Solo always works within the context of a project workspace, it is recommended that you create a new project workspace for each building or campus environment for which you do a network design.

When you create a new project workspace in LANPlanner Solo, you will be asked for the following information:

- Project specific information such as the designer's name, the customer the design is for, and any optional project notes.
- A list of obstruction materials used for performance analysis. Eight common types are suggested for you, and you may simply select the defaults.
- The number of floors desired for the facility model. Floors may be added or removed later.

To create a new project workspace, use the command **File > New/Open Project** to invoke the Building Wizard Setup dialog box shown below:

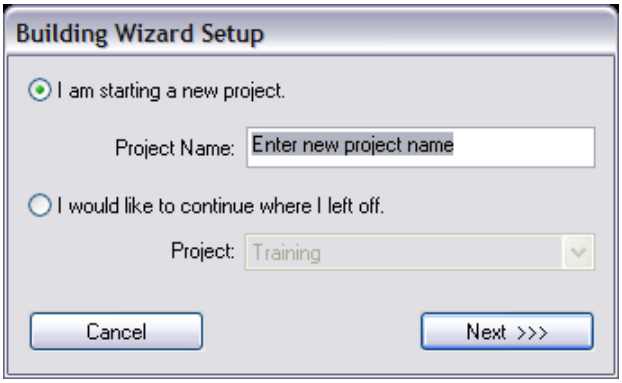


Figure 3.1: Building Wizard Setup dialog

Select the radio button labeled **I am starting a new project** and enter the name of the project you wish to create in the **Project Name** field. Pressing the **Next** button will launch the **Project Workspace Creation Wizard** which will guide you through the process of creating a new project workspace.

Project Workspace Creation Wizard

The Project Workspace Creation Wizard guides you through the process of creating a new project workspace. The individual steps of the wizard are detailed below.

Screen 1 below provides information about creating a new project workspace. Press **Next** to continue.

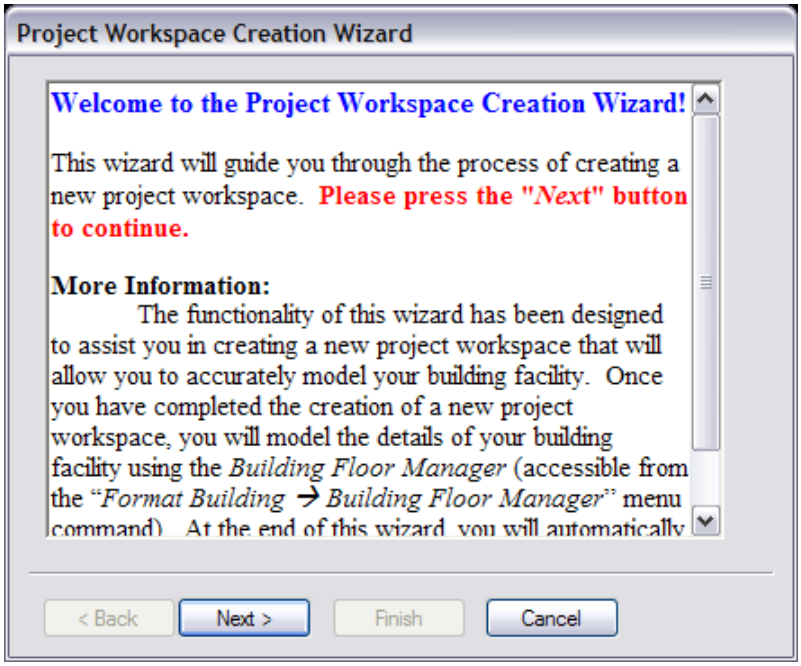

Project Workspace Creation Wizard
Welcome to the Project Workspace Creation Wizard!
This wizard will guide you through the process of creating a new project workspace. Please press the "Next" button to continue.
More Information:
The functionality of this wizard has been designed to assist you in creating a new project workspace that will allow you to accurately model your building facility. Once you have completed the creation of a new project workspace, you will model the details of your building facility using the Building Floor Manager (accessible from the "Format Building → Building Floor Manager" menu command). At the end of this wizard, you will automatically
< Back
Next >
Finish
Cancel

Figure 3.2: First screen of the Project Creation Wizard

Screen 2 below allows you to enter information about the project, customer, and any additional notes. You may enter information here in any way that you wish and the information will be stored in the current project workspace. The information you enter here is simply for your references and does not affect individual drawing files. To access or edit this information at a later time, use the **Utilities > Project Information** menu command.

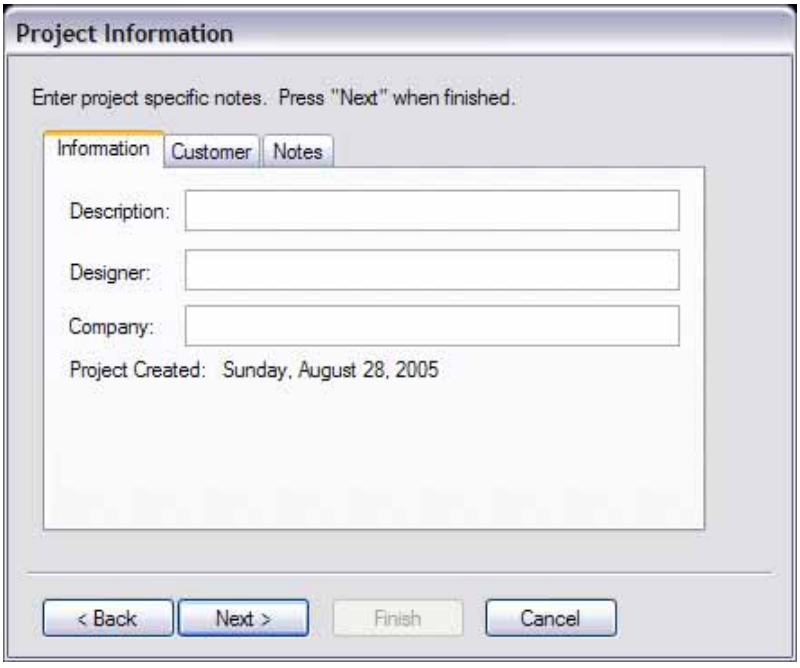


Figure 3.3: Second screen of the Project Creation Wizard

Screen 3 below, allows you to choose up to eight types of obstructions to model your facility. To choose different obstruction types, press the **Edit Materials** button. If none of the partitions listed are suitable, you may define your own partitions prior to creating a new project workspace. For more information on how to create your own partition types, see “Editing Partitions and RF Obstructions” on page 82.

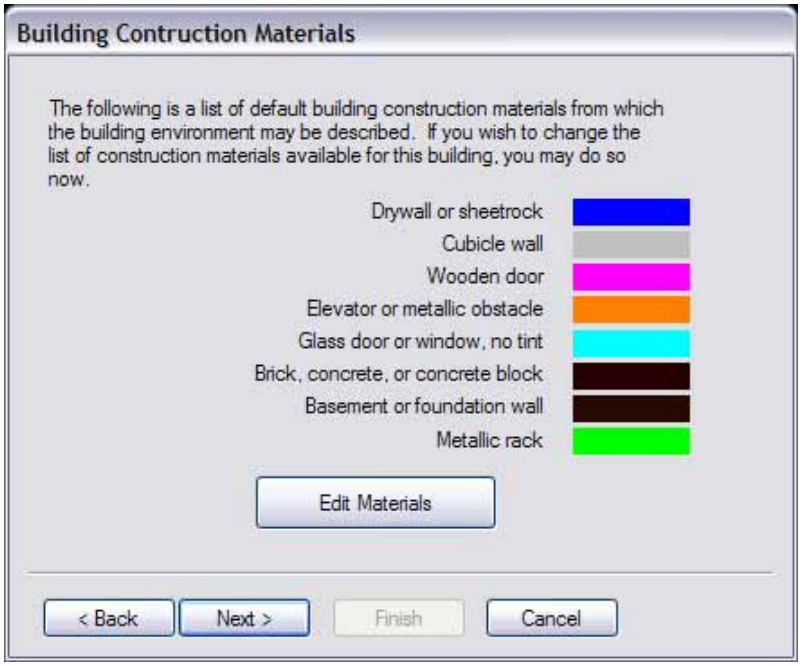

Building Contruction Materials
The following is a list of default building construction materials from which the building environment may be described. If you wish to change the list of construction materials available for this building, you may do so now.
Drywall or sheetrock
Cubicle wall
Wooden door
Elevator or metallic obstacle
Glass door or window, no tint
Brick, concrete, or concrete block
Basement or foundation wall
Metallic rack
Edit Materials
< Back
Next >
Finish
Cancel

Figure 3.4: Third screen of the Project Creation Wizard.

Screen 4 below, prompts you for the number of building floors that you wish to create for your building model. Floors may be added and removed later using the Building Floor Manager.

Set Number of Building Floors
How many floors would you like for this building to have?
01 floors
TIP: Floors may be added or removed later from the Building Manager.
< Back
Next >
Finish
Cancel

Figure 3.5: Fourth screen of the Project Creation Wizard

Screen 5 below, lets you know that you have successfully entered the information needed to create your new project workspace. Press the **Finish** button to complete the creation of the new project workspace. LANPlanner Solo then opens the **Building Floor Manager** so you can start modeling your building (see “Modeling a Building” on page 63).

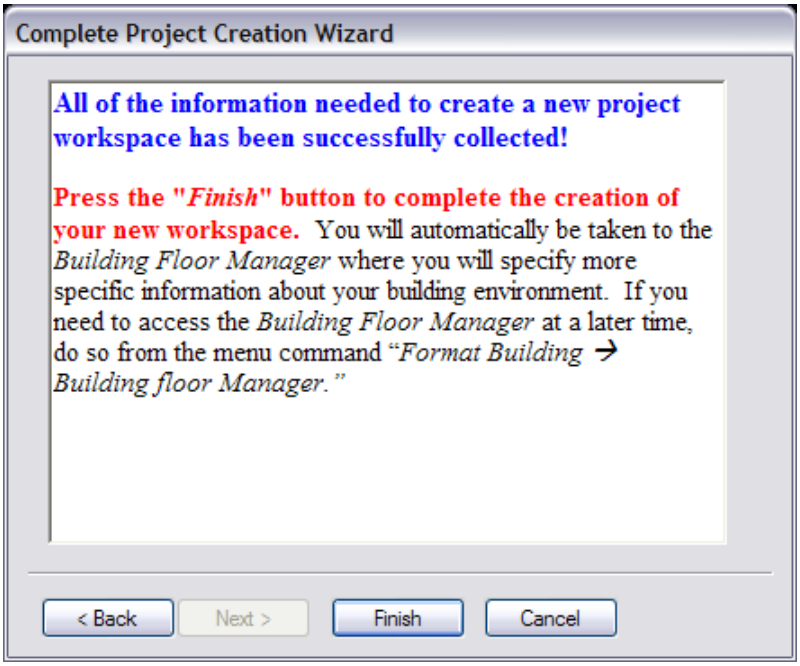

Complete Project Creation Wizard
All of the information needed to create a new project workspace has been successfully collected!
Press the "Finish" button to complete the creation of your new workspace. You will automatically be taken to the Building Floor Manager where you will specify more specific information about your building environment. If you need to access the Building Floor Manager at a later time, do so from the menu command "Format Building → Building floor Manager."
< Back
Next >
Finish
Cancel

Figure 3.6: Final screen of the Project Creation Wizard

Opening an Existing Workspace

To open an existing project workspace, use the menu command **File > New/Open Project** to invoke the **Building Wizard Setup** dialog box.

Select the radio button labeled “**I would like to continue where I left off**” and select the name of the project you wish to open in the **Project** pull down box. Pressing the **Next** button will set the chosen workspace to be the current project workspace. If an assembled **<workspace name>_Final.dwg** file exists in the newly opened workspace, then LANPlanner Solo will automatically open the final drawing for you, otherwise you will automatically be taken to the **Building Floor Manager**.

Project Workspace vs. Open Drawing

LANPlanner Solo uses the concept of a current project workspace to keep information about the building environment separate from information for other buildings. Upon first launching LANPlanner Solo, a project workspace is active. The name of the current project workspace is displayed in the bottom left corner of the screen. Even though LANPlanner Solo always works within its current project workspace, you may use the **File > Open Drawing** command to open a drawing file located outside of the current project workspace. Doing this will open the project workspace for the open drawing. You will be prompted to switch to the workspace for the drawing if it is in a different workspace.

Regardless of where the file you open exists on disk, you may use LANPlanner Solo to format the drawing and place access points. During your system design, information such as wall material types, attenuation factors, and already configured access points are pulled from information stored in the current project workspace. Therefore, it is important to keep in mind your current project workspace at all times, regardless of where the currently open file is stored on disk.

Assembled Final Drawings

As previously mentioned, LANPlanner Solo may perform work on the currently open file, regardless of where it exists on your hard drive, but certain information defaults to information stored in the current project workspace directory structure. Another important item to note about a project workspace is that there are certain file names that are reserved for use by LANPlanner Solo. For this reason, it is recommended that you use the **Building Floor Manager** to format and assemble floors of a multi-floor environment.

When the Building Floor Manager is invoked from the Format Building menu, your previously opened drawing file will be closed. If an assembled Final drawing already exist in your project workspace, accessing the Building Floor Manager will open that file after closing the currently open file. Building Floor Manager works on temporary files (one per building floor) that are stored in the **Formatted** subdirectory under your project workspace directory (the name you would like to call the new project workspace). Project Workspace directories exist on your PC under the Workspaces subdirectory under your main LANPlanner Solo installation directory.

As you will read in “Modeling a Building” on page 63, you select the Assemble Building button in the Building Floor Manager to create an assembled drawing file for a stacked multi- floor environment. This assembled drawing is given the name **<workspace name>_Final.dwg**. To prevent confusion, it is therefore recommended that you not create a file with a similar name.

Workspace Directory Structure

When LANPlanner Solo is installed, a directory structure is automatically created on your PC that helps organize your work and frees you from worrying about file management. Figure 3.7 shows an expanded view of this directory structure which, by default, exists under: **C:\Program Files\LANPlanner Solo**.

Each time you create a new project workspace in LANPlanner Solo, the necessary directory structure is automatically created. For example, **Default** is the workspace created by the software. New project directories are placed under the **Workspaces** directory. All directories above the Workspace directory are considered part of the global workspace. Consequently, the files contained in the global directories are available to all projects at any time. Changes to files in global workspace directories may directly impact all project workspaces.

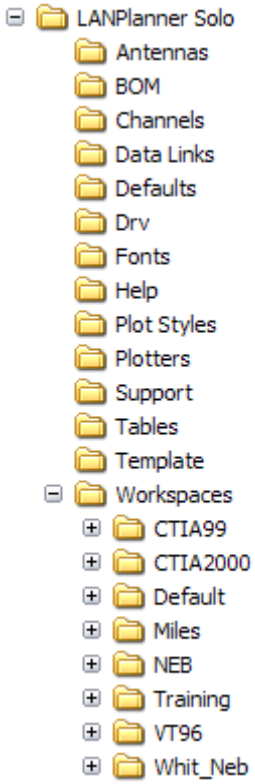


Figure 3.7: LANPlanner Solo directory structure

4 Creating Site-Specific Information - Modeling Buildings and Facilities

Introduction

LANPlanner Solo uses a 3D virtual model to represent the environment in which your wireless network will be deployed. This model is also called “site-specific information”. To create this virtual model, LANPlanner Solo requires that you import site-specific information before it can accurately predict system performance. This drawing file contains information about the location of walls and other obstructions as well as their type of construction material. The type of material that walls are made of is important in determining how radio signals propagate throughout a facility.

To create the 3D virtual model, you use the **Building Wizard** utility from within the **Format Building** menu. **Building Wizard** provides powerful functionality for modeling a building quickly and easily. The process of modeling a building includes specifying the location, height, and type of materials that make up the building floor plan. Once the 3D virtual model is finished, it serves as the basis for planning, testing, and maintaining your wireless network.

NOTE

The Building Floor Manager may be renamed as the Building Wizard in some versions.

Creating Site-Specific Information Workflow

The workflow diagram below provides an overview of the primary steps for creating a site-specific model.

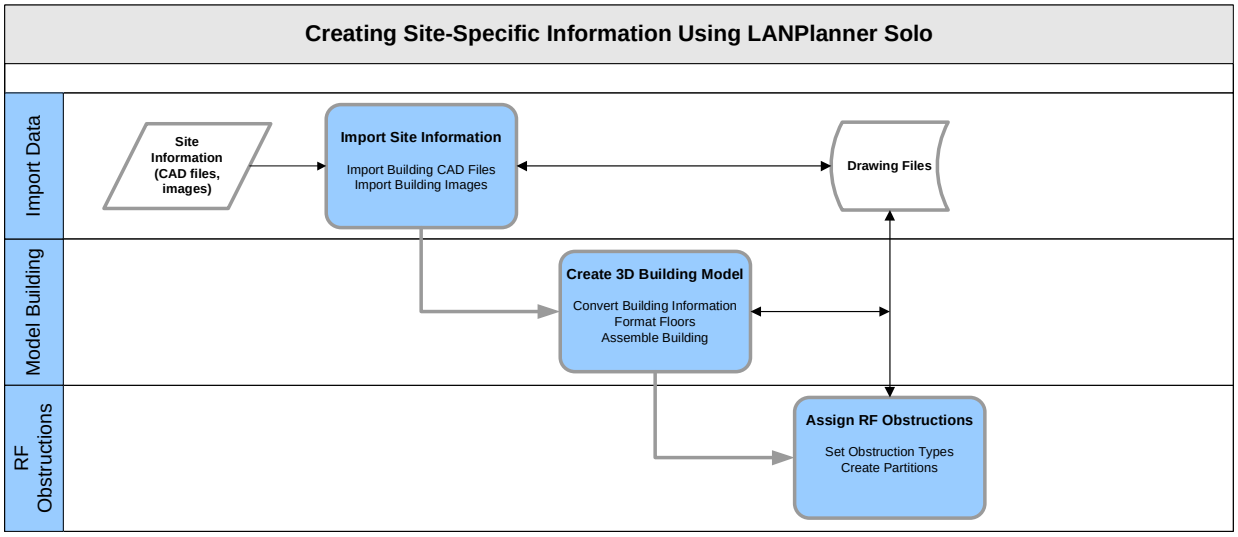


Figure 4.1: Creating Site-Specific Information Workflow

Importing Data

LANPlanner Solo provides a **Format Building** menu that leads you through the process of creating your 3D virtual environment model. **Format Building** supports three basic starting points for generating the three-dimensional drawing of a facility:

- Starting with a previously drawn CAD floor plan. File formats include .dwg, .dxf, 3DS, ACIS Solid, Drawing Exchange Binary, and others.
- Starting with a blueprint and converted into a scanned image format such as .bmp, .jpg, .tif, .wmf, .tga, .gif, etc.
- Starting from scratch and drawing the building floor plan from within LANPlanner Solo.

LANPlanner Solo Drawing Files

LANPlanner Solo contains internal drawing files which can only be accessed through LANPlanner Solo software products. Drawing files contain the following primary information:

- Building databases as collections of **buildings**
- Building file drawings as collections of **floors**
- Each building floor includes **obstructions** (walls, elevators, windows, clutter, etc.), the ceiling, and the floor
- All obstructions such as metal walls, windows, cubicle walls, elevators, etc. are modeled as **partitions**
- All partitions are considered attenuating obstructions by LANPlanner Solo's predictive engine and are assigned a RF signal attenuation factor depending on the material
- Obstructions with similar RF properties are grouped into partition categories
- Libraries of obstructions are easily created and managed

Modeling a Building

Converting Building Information Using Building Wizard

You use the Building Wizard to convert information about a building or campus floor plan layout into a 3D drawing database suitable for use by LANPlanner Solo's predictive engine. The Building Wizard provides an interface for allowing you to quickly model the different floors of your building and to assemble those floors into a final combined drawing. This assembled drawing is then used to perform cross floor system performance analysis using the tools within Network Design (see Chapter 5).

The Building Wizard is automatically launched after you create a new project workspace. The Building Wizard is also launched when you open an existing workspace that does not contain a final assembled drawing (see "Creating a New Project" on page 53). To launch the Wizard manually, select **Format Building > Building Floor Manager** from the LANPlanner Solo toolbar.

The Building Wizard operates on separate files (one per floor) during the floor formatting process. When working with multiple floors, you can use the **Assemble Building** button on the dialog box to combine formatted floors into a single combined drawing that will be stored in a single file named **<workspace name>_Final.dwg**. You should also click the Assemble Building button even if you only have one floor and are using the building floor manager. Otherwise, the software will report that you do not have an assembled drawing in the workspace as noted the paragraph two, above.

The Building Wizard runs within the context of the current project workspace. This means that information about floors created and formatted within the context of the Building Wizard will be saved in a project workspace file. Any work you for a particular workspace will be remembered the next time you launch LANPlanner Solo and reopen that same project workspace. For this reason you should create a new project workspace for each new building you format.

The following list provides a brief overview of the tasks you can perform within Building Wizard:

- Create a new floor that can be formatted and assembled
- Remove a floor
- Format a floor
- Edit a floor
- Rearrange the order of floors
- Assemble formatted floors into a single drawing database file

For LANPlanner Solo users: *After completing your facility model using the Building Wizard, you will be prompted to email the drawing to rfsoftwaresupport@motorola.com. Upon receipt, Motorola will attach a key to the drawing file which unlocks the Network Design menu, enabling you to place hardware and run RF predictions.*

The **Building Wizard** main dialog is shown below:

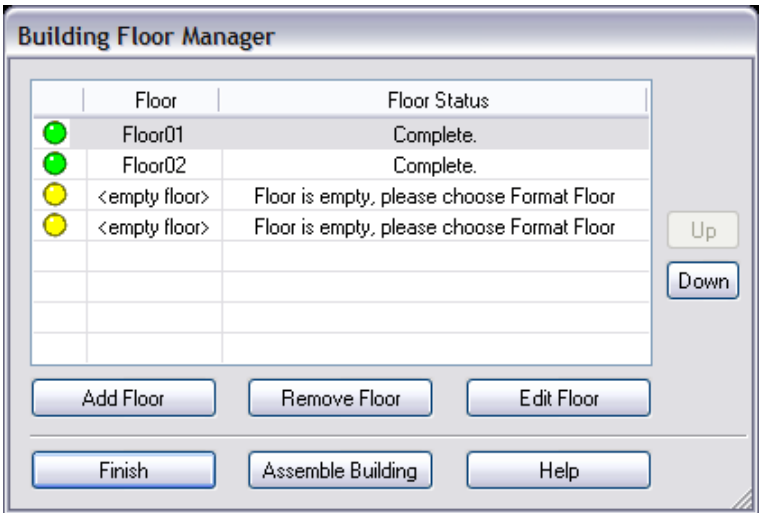


Figure 4.2: Building Floor Manager main dialog

The Building Wizard contains a list of floors ordered by floor number. A **green circle** next to a floor specifies that the floor has been properly formatted using the **Format Floor Wizard**. Selecting the floor causes the **Edit Floor** button to display. See “Editing Floors in an Existing Building Model” on page 79 for further details.

A **yellow circle** next to a floor specifies that the floor is empty and has not yet been formatted. Selecting the floor causes the **Format Floor** button to display. See “Formatting Floors Using the Floor Formatting Wizard” on page 67 for further details.

Add Floor

Use the **Add Floor** button on the Building Wizard main dialog to append a new unformatted floor to the end of the list of floors for the current project workspace.

Remove Floor

Use the **Remove Floor** button on the Building Wizard main dialog to remove the currently selected building floor from the list. Using this option will permanently delete the highlighted building floor and will reorder the remaining floors. For example, if you select Floor 2 from a list of three floors and press the Remove Floor button, Floor 2 will be completely removed (regardless of whether it has been formatted or not) and floor 3 will be renamed to Floor 2 automatically.

Up/Down

Use the **Up** and **Down** buttons to move the currently selected floor up or down in the list of floors. The first floor in the list will become the ground floor when the building is assembled, and the other floors in the list will be assembled in the order they are listed (one on top of the other).

Edit Floor

See “Editing Floors in an Existing Building Model” on page 79 for details of each of the **Edit Floor** options.

Help Button

Use the **Help** button on the Building Wizard main dialog box to launch the LANPlanner Solo User's Guide.

Assemble Building

Use the **Assemble Building** button to combine your formatted floors into a single drawing that can be used by LANPlanner Solo's predictive engine to perform cross floor system performance analysis.

NOTE

*The **Building Wizard** is intended to guide you through the process of formatting and assembling building floors BEFORE you begin a network design using the **Network Design** menu. **Pressing the Assemble Building button will overwrite your <workspace name>_Final.dwg file and delete all placed access points.** If you should need to make changes to your final assembled drawing (add or delete walls, etc.), you may do so with the formatting menu commands directly available from the **Format Building** menu instead of using the Building Floor Manager. See "Editing Partitions and RF Obstructions" on page 82 for details.*

You will be asked to perform two tasks when you press the Assemble Floors button: **(1) Set the legend position** and **(2) Verify the drawing**. These two steps are described in more detail below.

Step 1: Drawing Legend

- When you assemble the building floors, the Drawing Legend dialog box displays:

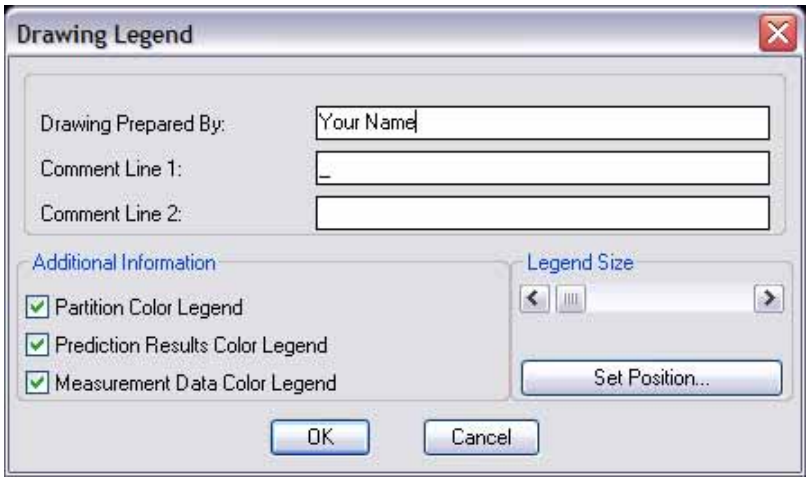


Figure 4.3: Drawing Legend dialog

- The information you enter in the Drawing Legend dialog box are for your reference and may be filled out with any text that you wish. The check boxes in the lower left corner of the Drawing Legend dialog allows you to set what information the legend displays in the drawing window. Once you have configured the legend, use the **Set Position** button to configure where the legend will be displayed in the drawing window. When you press the Set Position button, you will then be prompted to click in the drawing to set the new legend position. Choose the point in the drawing where you want the lower left corner of the legend to appear.
- Once you have finished configuring and placing the legend, press the OK button to dismiss the Drawing Legend dialog and continue to the Verify Drawing step. You may edit the drawing legend at a later time by accessing the menu command **Utilities > Legend**.

Step 2: Verifying Drawing Assembly

- Once you chosen to assemble building floors and then configured the drawing legend, you will be asked to verify that the drawing appears as you intended it to. This is your opportunity to make sure that you properly set the alignment points for a multi-floor building by making sure the floors stack up properly. The **Verify Drawing** dialog allows you to view the assembled drawing from multiple perspectives and to make sure floors are scaled relative to each other:

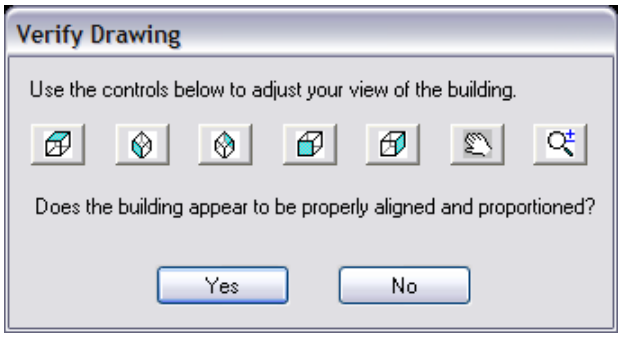

Verify Drawing
Use the controls below to adjust your view of the building.
Does the building appear to be properly aligned and proportioned?
Yes
No

Figure 4.4: Verify Drawing dialog

- Use the buttons to view the building from each of several different angles. Hovering your mouse over a button will give you a tool tip that will tell you what action the button performs.

If you are not satisfied with how your drawing looks, press the **No** button to return to the Building Floor Manager where you can correct any errors. Otherwise, press the **Yes** button finish the Assemble Floors process.Once the drawing is fully Assembeld in LANPlanner Solo, the prompt below displays, prompting you to email the drawing to rfsoftwaresupport@motorola.com. Upon receipt, Motorola will attach a key to the drawing file which unlocks the Network Design menu, enabling you to place hardware and run RF predictions. Once unlocked, you will be unable to add floors to the drawing or make significant modifications to the building model.

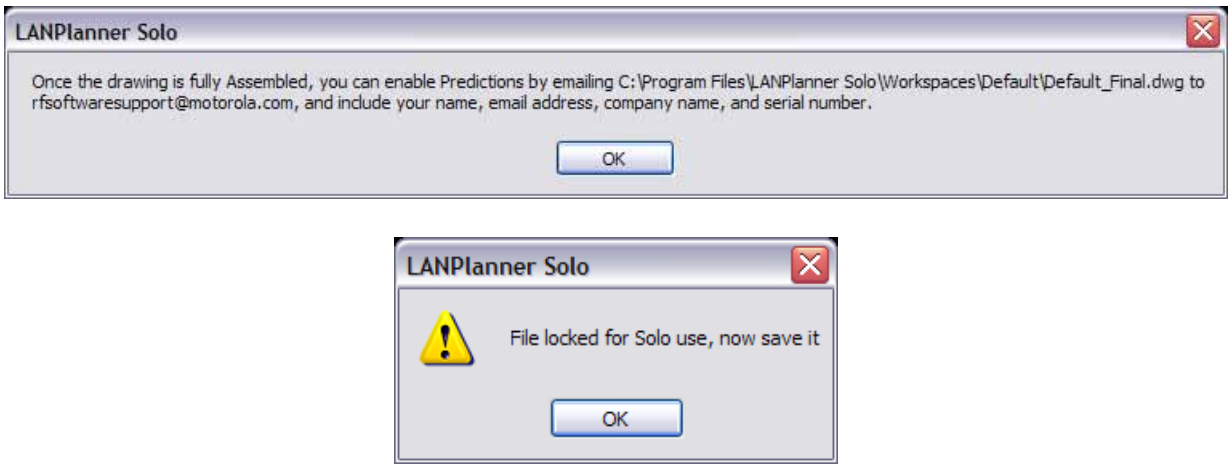

LANPlanner Solo
Once the drawing is fully Assembled, you can enable Predictions by emailing C:\Program Files\LANPlanner Solo\Workspaces\Default\Default_Final.dwg to rfsoftwaresupport@motorola.com, and include your name, email address, company name, and serial number.
OK
LANPlanner Solo
File locked for Solo use, now save it
OK

Figure 4.5: LANPlanner Solo prompts

After completing the Verify Drawing Assembly step,and receiving the keyed drawing file from Motorola, you now have a final drawing that may be used with LANPlanner Solo's predictive engine. See Chapter 5 for information on designing your network which includes placing access points, sensors, and predicting and visualizing network coverage.

Formatting Floors Using the Floor Formatting Wizard

The purpose of the **Floor Formatting Wizard** is to guide you through the steps that are required to import and format a floor for use by LANPlanner Solo's predictive engine. To properly format a floor, you need to begin with some basic information about the floor of the building, such as the location of where walls and obstructions are in relation to each other.

To begin formatting an unformatted floor, select an unformatted floor from the list of floors on the Building Floor Manager main dialog and then press the **Format Floor** button:

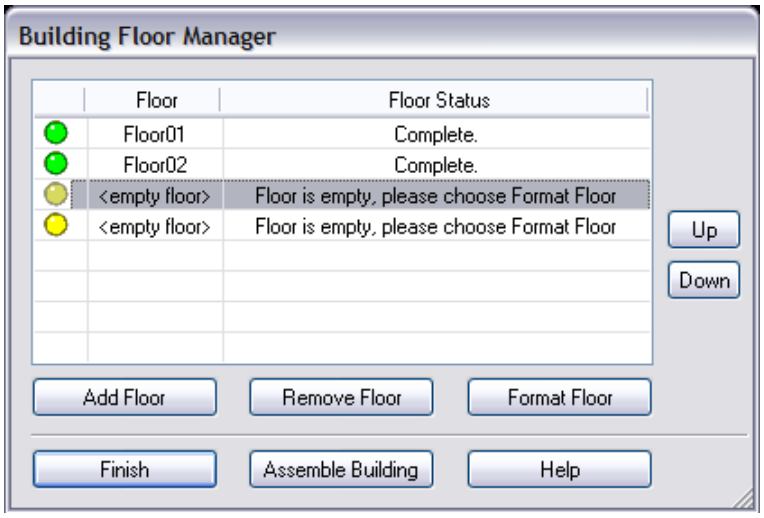


Figure 4.6: Building Floor Manager main dialog

Pressing the Format Floor button opens the **Floor Formatting Wizard**:

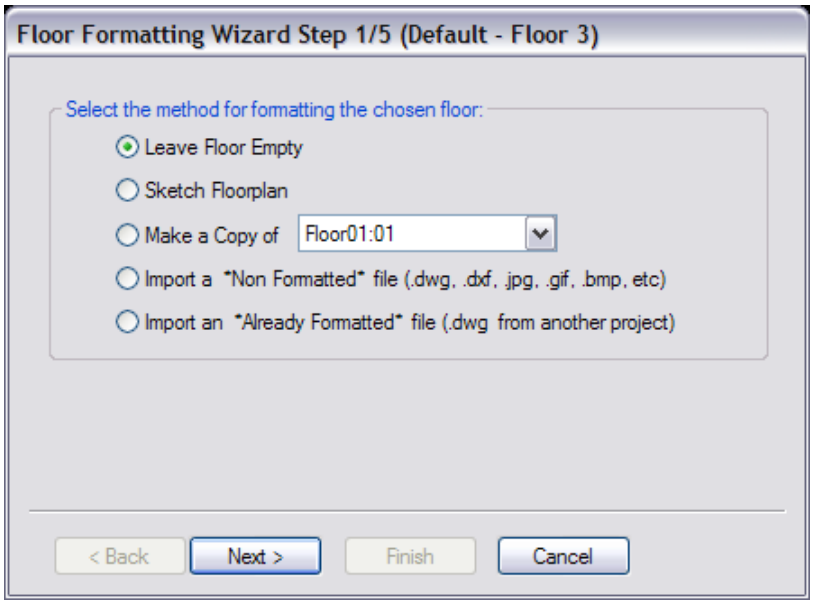

Floor Formatting Wizard Step 1/5 (Default - Floor 3)
Select the method for formatting the chosen floor:
Leave Floor Empty
Sketch Floorplan
Make a Copy of
Floor01:01
Import a "Non Formatted" file (.dwg, .dxf, .jpg, .gif, .bmp, etc)
Import an "Already Formatted" file (.dwg from another project)
< Back
Next >
Finish
Cancel

Figure 4.7: Initial screen of the Floor Formatting Wizard

The Floor Formatting Wizard supports the following methods as a starting point for entering information about a floor:

- **Leave Floor Empty -** This option allows you to defer formatting this floor until a later time.
- **Sketch Floor Plan —** Use this option to freehand sketch the layout of a building floor plan. LANPlanner Solo supports a variety of drawing tools that make this process easy. The drawing tools allow you to do such things as make straight lines, make perpendicular lines, make exact end point connections of lines, and draw rooms. The freehand sketch method is most often used when another form of an electronic blueprint is not available. When drawing a line, you first specify its height and material type. LANPlanner Solo automatically takes care of building the three dimensional building database model as you sketch.
- **Make Copy of Floor —** Make a copy of a floor that you have previously formatted in the current project workspace by using the Format Floor Wizard.
- **Import Non Formatted File —** Allows you to import an unformatted file such as an AutoCAD architect file, raster bitmap image, etc., that you can use to trace the walls of the floor plan. After importing an unformatted raster image file, you use the same easy drawing tools of the Sketch Floor Plan mode to specify where walls exist, their height, and what type of material they are made of. LANPlanner Solo automatically takes care of building the three dimensional building database model as you sketch. If you import an unformatted AutoCAD file, you will be given the opportunity to select the individual drawing entities (one by one, or by layer) and process them all at once as a particular type of construction material.
- **Import Preformatted File —** This option allows you to import a floor from a previously formatted LANPlanner Solo file. This can be useful if you share the work of formatting floors with other team members. Each team member can format a separate floor, then the floors may later be combined into a single drawing using this option.

The Floor Formatting Wizard is a Windows style guide that includes several navigation buttons allowing you to change from one dialog to the next. On each dialog you will be asked to review information or perform an action. Once you have stepped through each dialog in the wizard, you will have the option to press the **Finish** button on the wizard to save your work. If at any time you wish to abort the wizard, press the **Cancel** button (This will abort any formatting you have done to the floor, and your work will be lost). Press the **Next** button on the wizard to continue to the next step. Use the **Back** button to repeat previous steps.

Detailed instructions on formatting floors by various methods are described in the following sections.

Leave Floor Empty

Selecting the **Leave Floor Empty** option on the first dialog of the **Floor Formatting Wizard** is the same as pressing the **Cancel** button on the **Floor Formatting Wizard** dialog. Choose this option if you decide that you do not wish to format this floor at this time. Pressing the **Next** button will present you with a screen stating that you have chosen to leave the selected floor empty. Simply press the **Finish** button on the **Floor Formatting Wizard** to return to the main dialog of the Building Floor Manager.

Sketch Floor Plan

Selecting the **Sketch Floor Plan** option on the first dialog of the Floor Formatting Wizard will allow you to sketch the layout of a building floor plan. There are six steps to sketching a floor plan:

Step 1: Select Sketch Floor Plan

- After selecting the **Sketch Floor Plan** option on the first dialog of the Floor Formatting Wizard, press the **Next** button to continue to step two of the wizard.

Step 2: Set Slab-to-Slab Height

- Step two of sketching a floor plan is shown below. Step two allows you to enter the desired height for the floor. You may do so in either feet or meters.

Floor Formatting Wizard Step 2/5 (Default - Floor 3)
Please enter the ceiling height for this floor, then hit Next.
10.8
Feet
< Back
Next >
Finish
Cancel

Figure 4.8: Floor Formatting Wizard: Setting the slab-to-slab height

Step 3: Sketch Floor

- Step three of sketching a floor plan is shown below:

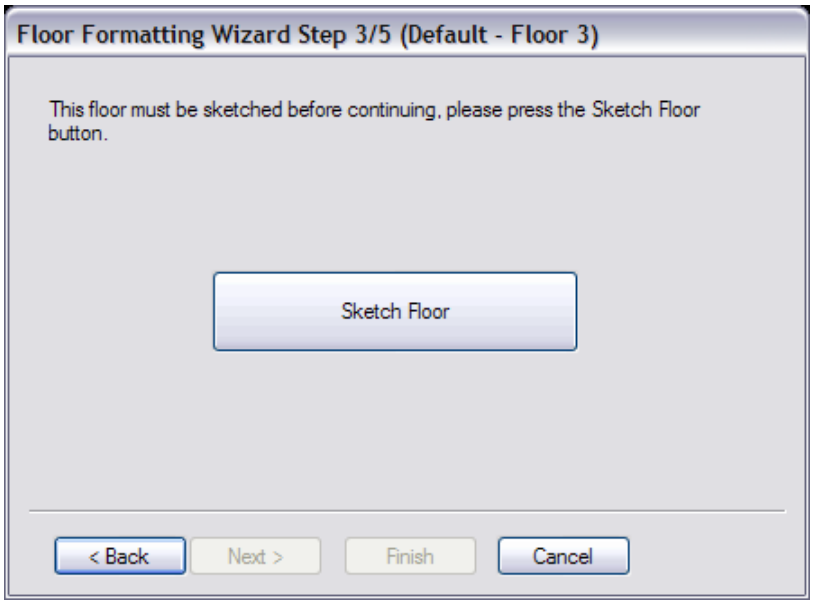

Floor Formatting Wizard Step 3/5 (Default - Floor 3)
This floor must be sketched before continuing, please press the Sketch Floor button.
Sketch Floor
< Back
Next >
Finish
Cancel

Figure 4.9: Floor Formatting Wizard: Sketch floor

- Press the **Sketch Floor** button to begin sketching the floor plan. Pressing the Sketch Floor button will cause you to temporarily leave the Floor Formatting Wizard, but once you are finished sketching the floor plan you will automatically be taken back to where you left off in the Floor Formatting Wizard.
- Press Sketch Floor to display the Draw Partition dialog shown below:

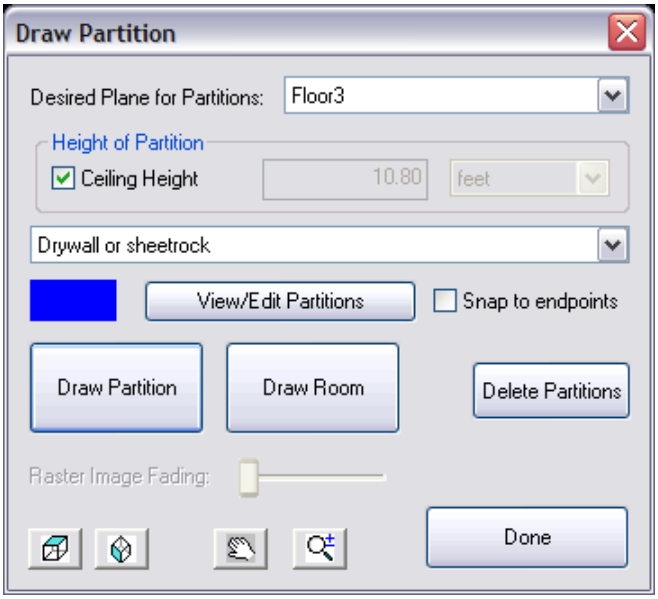


Figure 4.10: Draw Partition Dialog

- The **Draw Partition** dialog box enables you to add new partitions to the drawing. This is used most frequently when tracing over an imported raster image of a blueprint, but may also be used to sketch a

floor plan from scratch. If you are using this manual as a step-by-step follow along guide, see “Drawing Partitions” on page 86 now for additional information on drawing partitions, then return to this section to continue with sketching a floor plan using the Floor Formatting Wizard.

Step 4: Scale Floor

- Step four requires that you scale the floor you sketched in step three. It is important for LANPlanner Solo to know the relational distance of one wall to another so that it can accurately predict system performance. Press the **Scale Floor** button on the wizard dialog shown in Figure 4.11 to begin scaling the drawing.

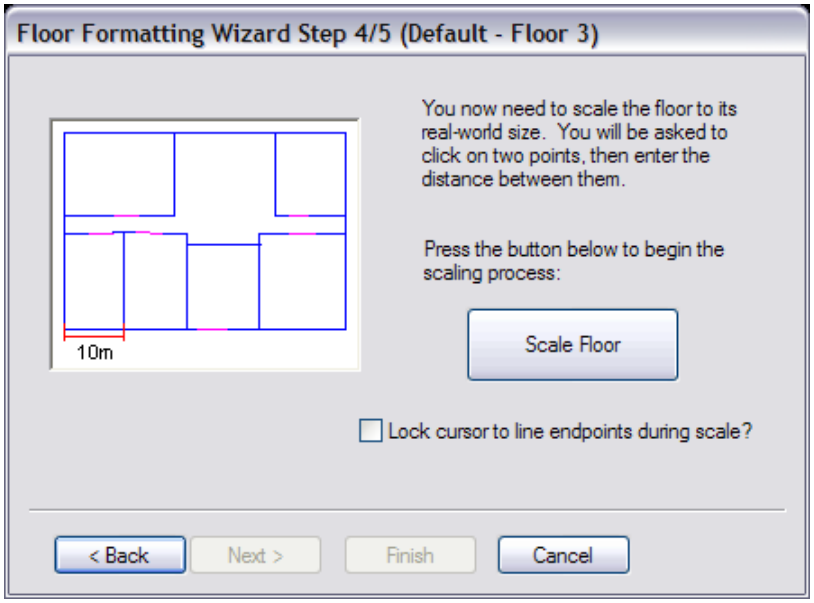

Floor Formatting Wizard Step 4/5 (Default - Floor 3)
10m
You now need to scale the floor to its real-world size. You will be asked to click on two points, then enter the distance between them.
Press the button below to begin the scaling process:
Scale Floor
Lock cursor to line endpoints during scale?
< Back
Next >
Finish
Cancel

Figure 4.11: Floor Formatting Wizard: Scale Drawing

- You will be prompted to select two locations by left clicking your mouse at two different points in the drawing. After selecting two points, you will then be prompted to enter the physical real world distance between those two points.
- The check box option to **Lock cursor to line endpoints during scale** enables you to accurately scale the drawing based on the distance from the end point of one wall to the end point of another wall. Using this option will cause your mouse cursor to exactly lock onto the end of wall, even if you do not click precisely on an end point. “Editing Partitions and RF Obstructions” on page 82 provides information on scaling an already assembled final drawing without using the Building Floor Manager.

Step 5: Set Floor Alignment Point

- Step five requires that you set an alignment point for the floor. The alignment point you choose will become the origin for the x-y plane represented by a top-down view of the drawing. The Building Floor Manager uses the origin of the x-y plane to align building floors vertically with the **Assemble Floors** command. Therefore, it is important that you choose a floor alignment point that is common among all floors that you wish to align. You can also choose a common point on an elevator shaft or stairwell. For example, choosing the bottom left corner of every floor will often work well for rectangular shaped floors.
- To set the floor alignment point, press the **Set Alignment Point** button shown below and then click the point on the drawing that you wish to become the origin.

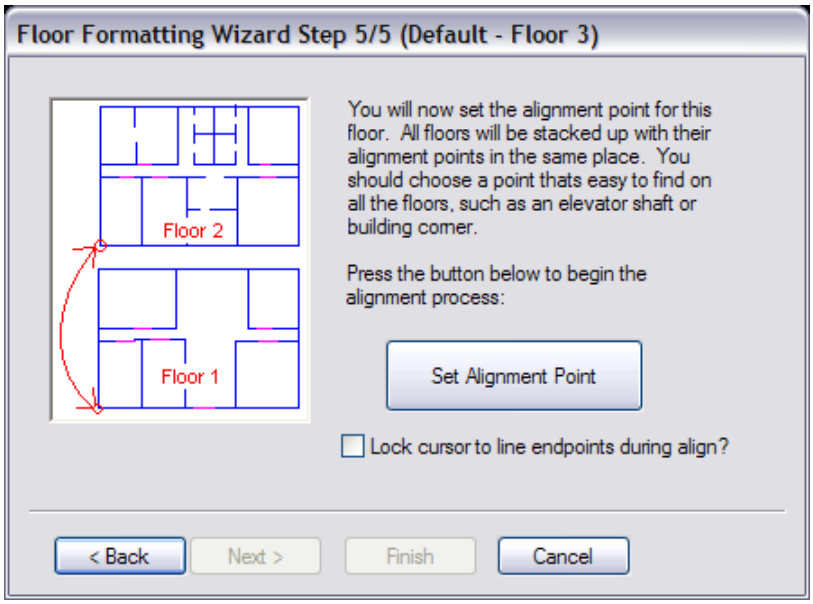

Floor Formatting Wizard Step 5/5 (Default - Floor 3)
Floor 2
Floor 1
You will now set the alignment point for this floor. All floors will be stacked up with their alignment points in the same place. You should choose a point thats easy to find on all the floors, such as an elevator shaft or building corner.
Press the button below to begin the alignment process:
Set Alignment Point
Lock cursor to line endpoints during align?
< Back
Next >
Finish
Cancel

Figure 4.12: Floor Formatting Wizard: Set Floor Alignment Point

- Similar to the Scale Floor command, you may check the option to **Lock cursor to line endpoints during align** before setting the floor alignment point. This option will allow you to set the origin at the end point of a line with exact mouse click precision.

Step 6: Verify Formatting Steps

- This final step, shown below, highlights the formatting steps that you have performed. Should you wish to redo any of the steps, use the **Back** button to go back to a previous step. Otherwise, press the **Finish** button to complete the formatting of the current floor and return to the Building Floor Manager.

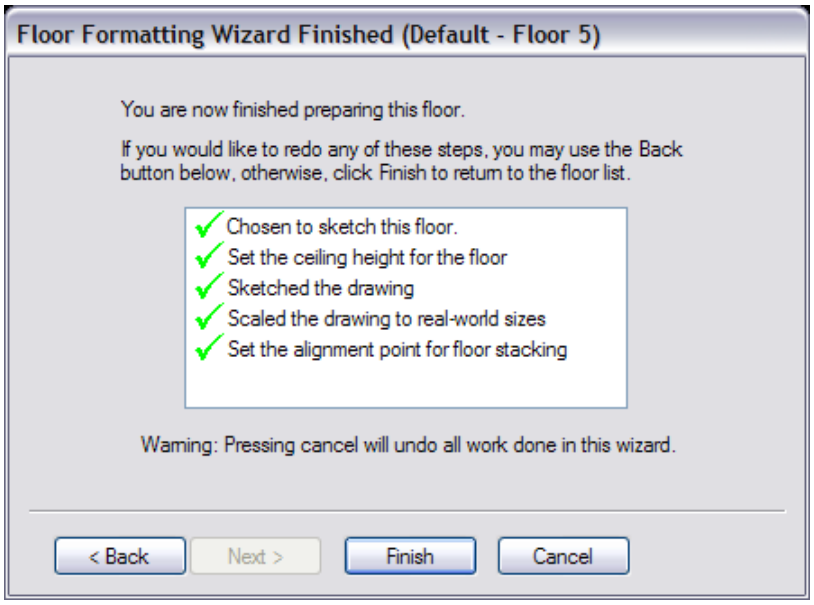

Floor Formatting Wizard Finished (Default - Floor 5)
You are now finished preparing this floor.
If you would like to redo any of these steps, you may use the Back button below, otherwise, click Finish to return to the floor list.
Chosen to sketch this floor.
Set the ceiling height for the floor
Sketched the drawing
Scaled the drawing to real-world sizes
Set the alignment point for floor stacking
Warning: Pressing cancel will undo all work done in this wizard.
< Back
Next >
Finish
Cancel

Figure 4.13: Floor Formatting Wizard: Verify Formatting Steps

Making a Copy of a Floor

Select the **Make Copy of Floor** option on the first dialog of the Floor Formatting Wizard to create an exact copy of an already formatted floor. Select the floor you wish to copy from in the pull down box to the right of the Make a Copy option. Click the **Next** button to perform the copy.

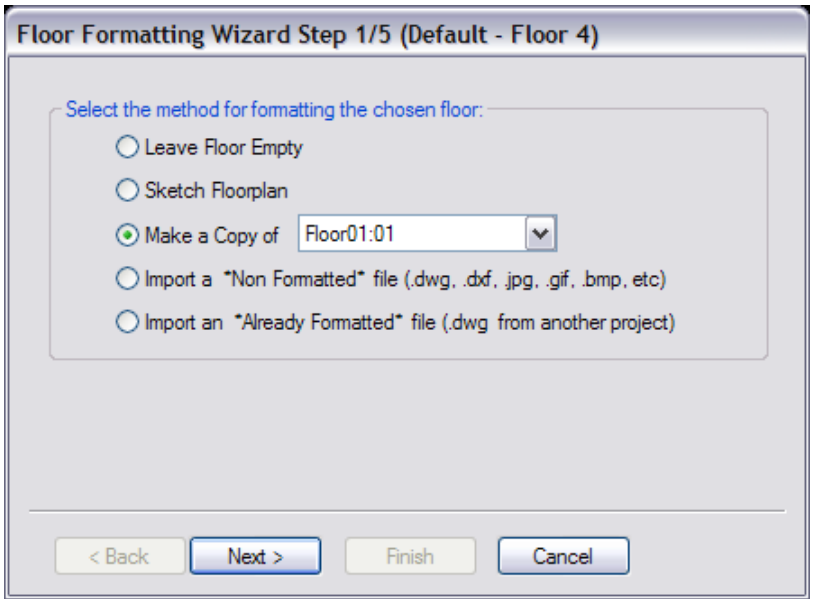

Floor Formatting Wizard Step 1/5 (Default - Floor 4)
Select the method for formatting the chosen floor:
Leave Floor Empty
Sketch Floorplan
Make a Copy of
Floor01:01
Import a "Non Formatted" file (.dwg, .dxf, .jpg, .gif, .bmp, etc)
Import an "Already Formatted" file (.dwg from another project)
< Back
Next >
Finish
Cancel

Figure 4.14: Making a copy of a floor

Importing an Unformatted File

Select the **Import a Non Formatted** file option on the first dialog of the Floor Formatting Wizard to begin the process of importing an unformatted drawing file.

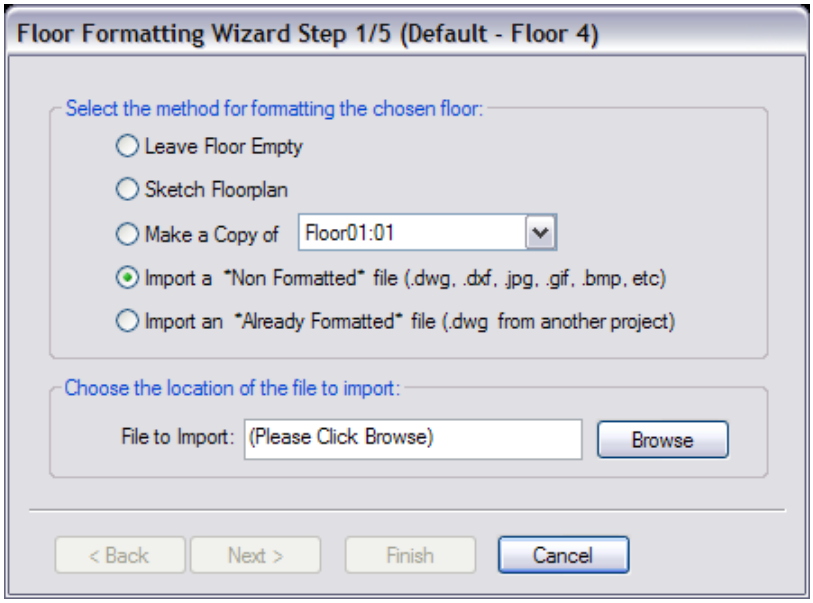

Floor Formatting Wizard Step 1/5 (Default - Floor 4)
Select the method for formatting the chosen floor:
Leave Floor Empty
Sketch Floorplan
Make a Copy of
Floor01:01
Import a "Non Formatted" file (.dwg, .dxf, .jpg, .gif, .bmp, etc)
Import an "Already Formatted" file (.dwg from another project)
Choose the location of the file to import:
File to Import:
(Please Click Browse)
Browse
< Back
Next >
Finish
Cancel

Figure 4.15: Importing a Non-Formatted file

Follow the six steps below to properly format an unformatted drawing file:

Step 1: Choose File Import Location

- As shown in Figure 4.15, choosing to import an unformatted floor will display an additional option where you must select the location of the unformatted file you wish to import. Use the **Browse** button to locate your unformatted file on disk, then press **Next** to proceed to step two. It is a good idea to store your unformatted files in the unformatted folder of your project workspace. This is the default folder opened when clicking the **Browse** button. Files will also be copied there when opened from another location.

Step 2: Set Slab-to-Slab Height

- This follows the same process as “Set Slab-to-Slab Height” on page 69.

Step 3: Format the Floor

- This step, shown below, is used to process the unformatted floor.

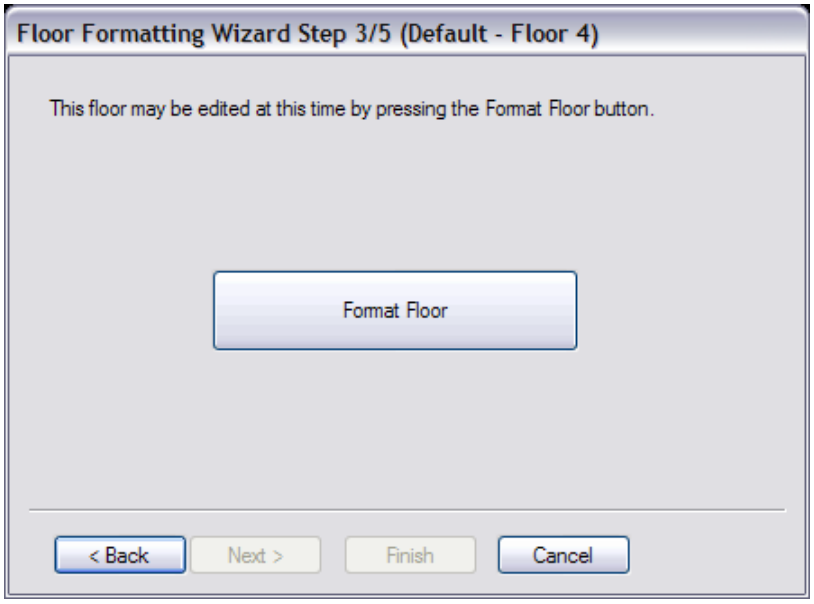

Floor Formatting Wizard Step 3/5 (Default - Floor 4)
This floor may be edited at this time by pressing the Format Floor button.
Format Floor
< Back
Next >
Finish
Cancel

Figure 4.16: Floor Formatting Wizard: Format Floor

- Press the **Format Floor** button to temporarily leave the Floor Formatting Wizard so that you may process the unformatted file. Pressing the Format Floor button will give you different formatting options based on the type of unformatted input file you chose in step one. If you chose to import a LANPlanner Solo recognized CAD file format, you will be taken to the **Process Unformatted Information** dialog shown in Figure 4.23. If you chose to import a raster file in step one (such as a bitmap or jpeg), you will be taken to the **Draw Partition** dialog shown below:

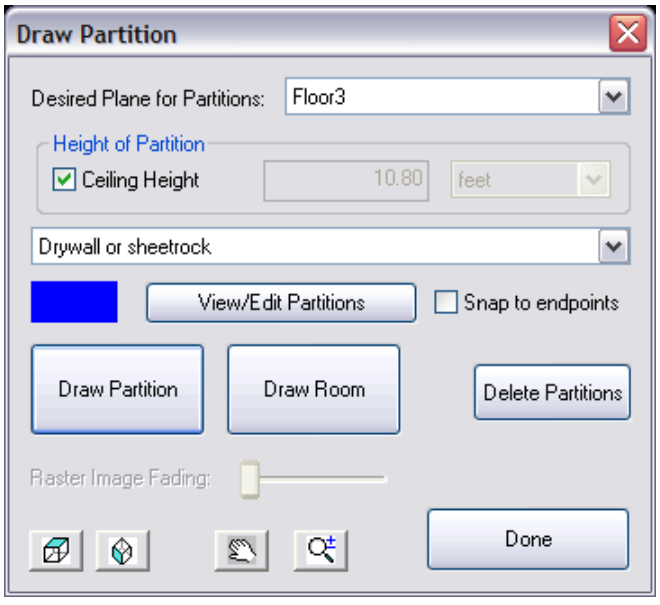


Figure 4.17: Draw Partition Dialog

- For more information on processing a CAD drawing file with the Process Unformatted dialog, see “Format CAD Drawing” on page 82.
- For more information on processing a raster image with the Draw Partition dialog, see “Drawing Partitions” on page 86.
- Once you have completed formatting your drawing file, press the **Next** button to continue to step four.

Step 4: Scale the Drawing

- Step four requires that you scale the floor you have sketched. It is important for LANPlanner Solo to know the relational distance of one wall to another so that it can accurately predict system performance. Press the **Scale Floor** button on the wizard dialog shown in Figure 4.18 to begin scaling the drawing. You will be prompted to select two locations by left clicking your mouse at two different points in the drawing. After selecting two points, you will then be prompted to enter a the physical real world distance between those two points.
- You may choose to check the option to Lock cursor to line end points during scale on Figure 4.18 to enable you to accurately scale the drawing based on the distance from the end point of one wall to the end point of another wall. “Scale Drawing” on page 96 provides additional information on scaling a final assembled drawing without using the Building Floor Manager.

NOTE

You cannot lock you cursor to elements in an image, only objects in the drawing such as lines or partitions.

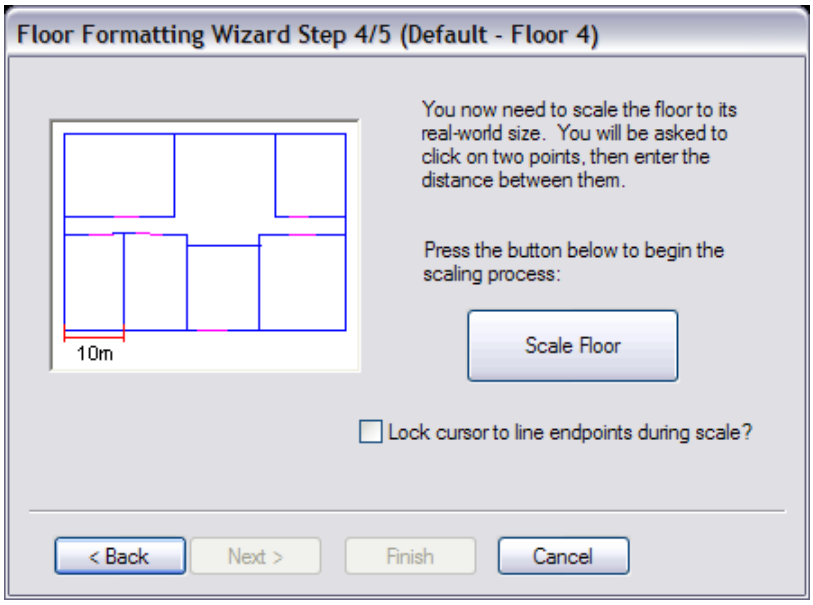

Floor Formatting Wizard Step 4/5 (Default - Floor 4)
10m
You now need to scale the floor to its real-world size. You will be asked to click on two points, then enter the distance between them.
Press the button below to begin the scaling process:
Scale Floor
Lock cursor to line endpoints during scale?
< Back
Next >
Finish
Cancel

Figure 4.18: Floor Formatting Wizard: Scale Drawing

Step 5: Set Floor Alignment Point

- Step five requires that you set an alignment point for the floor. The alignment point you choose will become the origin for the x-y plane represented by a top-down view of the drawing. The Building Floor Manager uses the origin of the x-y plane to align building floors vertically with the Assemble Floors command. Therefore, it is important that you choose a floor alignment point that is common among all floors that you wish to align. For example, choosing the bottom left corner of every floor will often work well for rectangular shaped floors.
- To set the floor alignment point, press the Set Alignment Point button shown in Figure 4.19 and then click the point on the drawing that you wish to become the origin.
- Similar to the **Scale Floor** command, select **Lock cursor to line endpoints during align** before setting the floor alignment point. This option will allow you to set the origin at the end point of a line with precision.

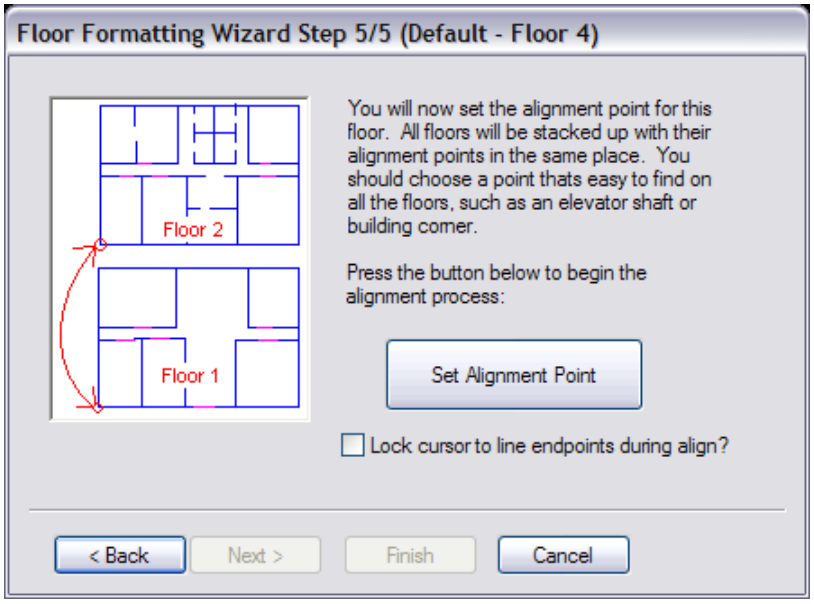

Floor Formatting Wizard Step 5/5 (Default - Floor 4)
Floor 2
Floor 1
You will now set the alignment point for this floor. All floors will be stacked up with their alignment points in the same place. You should choose a point thats easy to find on all the floors, such as an elevator shaft or building corner.
Press the button below to begin the alignment process:
Set Alignment Point
Lock cursor to line endpoints during align?
< Back
Next >
Finish
Cancel

Figure 4.19: Floor Formatting Wizard: Set Floor Alignment Point

Step 6: Verify Formatting Steps

- Step six shows you the formatting steps that you have performed (see Figure 4.13). Should you wish to redo any of the steps, use the **Back** button to go back to a previous step. Otherwise, press the **Finish** button to complete the formatting of the current floor and return to the Building Floor Manager.

Import Preformatted File

Select the **Import an Already Formatted file** option on the first dialog of the Floor Formatting Wizard to import a floor from a file that has already been formatted with LANPlanner Solo:

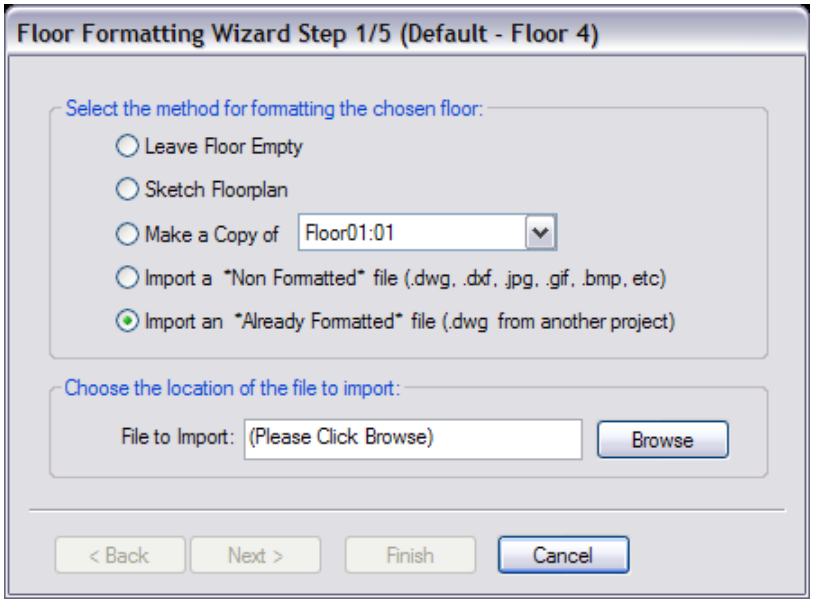

Floor Formatting Wizard Step 1/5 (Default - Floor 4)
Select the method for formatting the chosen floor:
Leave Floor Empty
Sketch Floorplan
Make a Copy of
Floor01:01
Import a "Non Formatted" file (.dwg, .dxf, .jpg, .gif, .bmp, etc)
Import an "Already Formatted" file (.dwg from another project)
Choose the location of the file to import:
File to Import:
(Please Click Browse)
Browse
< Back
Next >
Finish
Cancel

Figure 4.20: Importing an Already Formatted file

Choosing to import a preformatted floor will display an additional option where you must select the location of the unformatted file you wish to import. Use the **Browse** button to locate your unformatted file on disk, then press **Next** to proceed to step two.

If the file you choose to import has more than one floor, you will be prompted to select which floor number you would like to import from the already formatted file.

Importing from an already formatted file gives you the ability to use a team of multiple people to format the floors of a building, then quickly assemble the multiple floors into one single drawing.

Editing Floors in an Existing Building Model

Editing a floor in the Building Floor Manager allows you to make modifications to a floor that you have already formatted with the Format Floor Wizard. The **Edit Floor** option will only be available for floors that have already been formatted. To begin editing a floor, choose an already formatted floor from the list of floors on the Building Floor Manager's main dialog and then press the **Edit Floor** button:

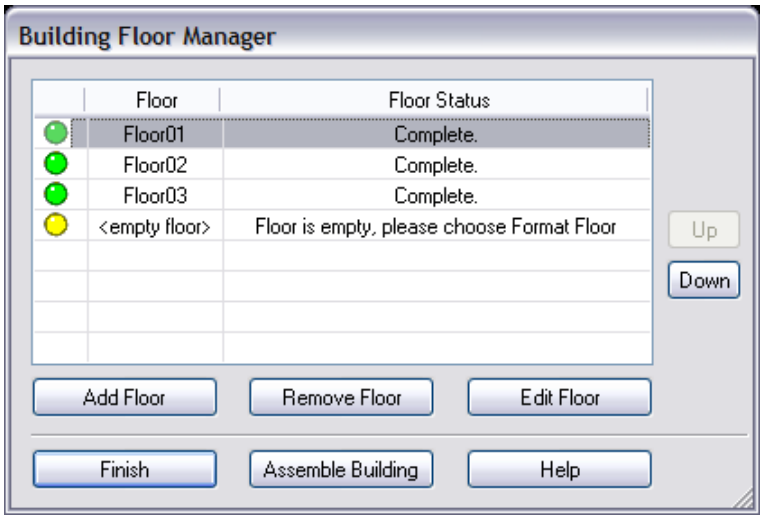


Figure 4.21: Building Floor Manager main dialog

Select the **Edit Floor** button to modify an already formatted floor using the Floor Formatting Wizard. Selecting an empty floor causes the **Format Floor** button to display. See "Formatting Floors Using the Floor Formatting Wizard" on page 67 for further details.

The following options are available from the Building Floor Manager dialog (see Figure 4.22):

- Rescale Floor
- Reset Floor Alignment Point
- Draw New Partitions
- Convert Partition Type
- Process Unformatted Layers
- Clear Floor
- Edit Floor Name

BDM Wizard Edit Floor Dialog, Currently Editing Floor 1
Edit Floor Description:
Floor Name: Floor01
Choose one of the following options to perform for this floor:
Rescale Floor
Set the x/y ratio of partitions to a real world unit of measure.
Reset Floor Alignment Point
Choose location for aligning this floor upon assembly.
Draw New Partions
Draw/Add new partitions to the current floor diagram.
Convert Partition Type
Convert a partition from one type of material to a different material.
Process Unformatted Layers
Convert unformatted floor layers into partitions.
Clear Floor
Delete all floor contents, returning it to the unformatted state.
Snap to endpoint when scaling floor or setting floor alignment point.
Done

Figure 4.22: Edit Floor dialog

Rescale Floor

The **Rescale Floor** button allows you to set the scale for the floor you have chosen to edit from the Building Floor Manager's main dialog. The scaling command will resize all entities within the floor. You will be prompted to select two points in the drawing (by clicking with the mouse) and then you will be prompted to enter the actual physical real world distance between the two locations. The appropriate scaling will be applied so that the distance between the points within the drawing matches the value you enter.

See "Snap to Endpoint" on page 81 for information on how to select your scaling points more accurately.

Reset Floor Alignment Point

The **Reset Floor Alignment Point** button allows you to choose the location that you wish to be the origin of the x-y plane of the top down perspective of the floor. The point you choose to be the origin is also the point within the drawing that will be used to align this floor with floors above and below.

See "Snap to Endpoint" on page 81 for information on making your origin point selection more accurately.

Draw New Partitions

The **Draw New Partitions** button allows you to draw new walls to the floor you have chosen to edit. Press the Draw New Partitions button to be taken to the Draw Partition dialog detailed in section "Drawing Partitions" on page 86. With the Draw Partition dialog, you draw individual partitions, a square room, and delete partitions.

Convert Partition Type

The **Convert Partition Type** button lets you convert individual wall entities from one type of partition to another. Select the type of partition you want to convert to using the pull down menu on the **Change Partition Type** dialog box (shown in Figure 4.34), then press the **Select** button. Any entities you select with your left mouse button at this point will be converted into the new partition type you selected when you right click your mouse. Use the **ESC** key to return to the Convert Partition Type dialog.

See “Change Partition” on page 89 for more information on converting partition types.

Process Unformatted Layers

The **Process Unformatted Layers** button lets you return to the Format CAD Drawing dialog box that the Floor Formatting Wizard uses to allow you to process the layers of a CAD file that contains unformatted entities.

It is unlikely that you will ever need to return to this dialog once a floor has already been formatted, but the functionality is provided here just in case.

NOTE

Layers will not be available for formatting if you choose to delete the remaining unformatted entities after formatting the CAD drawing

See “Format CAD Drawing” on page 82 for more information on formatting a CAD file using the Process Unformatted Information dialog.

Clear Floor

The **Clear Floor** button allows you to empty the contents of a floor and return the floor to the unformatted state.

CAUTION

There is no way to undo the Clear Floor option, so only use it if you intend to reformat a floor using the Format Floor Wizard.

Snap to Endpoint

The “**Snap to endpoint when scaling floor or setting floor alignment point**” option will allow you to more precisely click exactly on the end point of a line in the drawing. Check this option to able the automatic snap of the mouse cursor to the end points of lines.

Editing Partitions and RF Obstructions

The **Format Building menu**, shown in Figure 2.9 and discussed in “Modeling a Building” on page 63, contains menu commands for creating a drawing that LANPlanner Solo’s predictive engine can use for system performance analysis. This section provides more details about the following commands on the Format Building menu that affect Partitions and RF Obstructions:

- Format CAD Drawing
- Draw Partition
- Change Partition
- Current Partition Categories
- Edit Partition Library
- Scale Drawing

Format CAD Drawing

The **Format Building > Format CAD** Drawing dialog box can be used to process an AutoCAD file (single floor) for use by LANPlanner Solo’s predictive engine without using the Building Floor Manager. If you wish to assemble a floor with other floors (stack the floors), then it will be necessary to use the Building Floor Manager to perform the assembly. The Format CAD Drawing dialog is shown below:

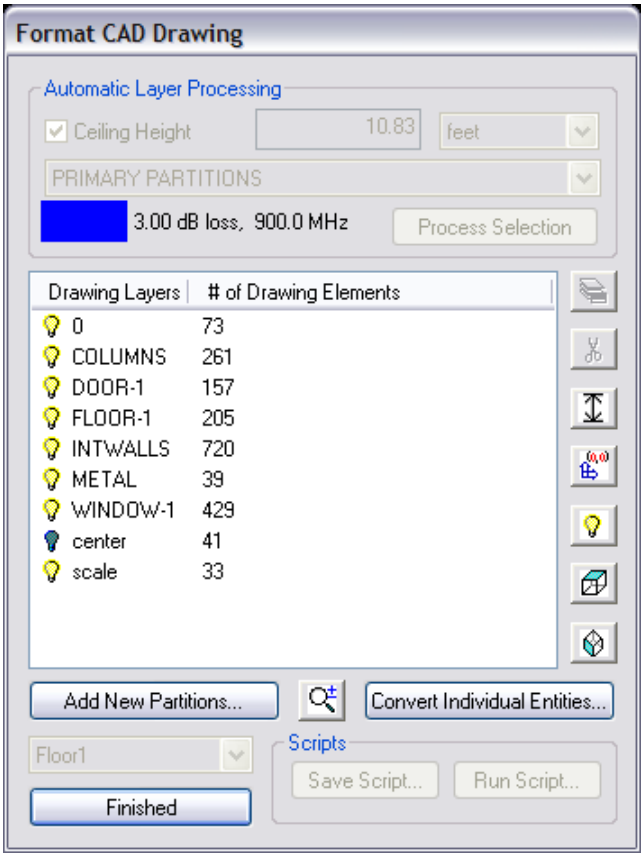


Figure 4.23: The Format CAD Drawing dialog box

To format an AutoCAD file without using the Building Floor Manager:

Select **File > Open Drawing** to open the AutoCAD file.

Next, choose the **Format Building > Format CAD Drawing** menu command to launch the dialog box. This dialog allows you to manually format the layers in an AutoCAD file.

When the Format CAD Drawing command is initiated, some preparatory work will be performed on the open AutoCAD file. In the course of this operation, LANPlanner Solo will search through the entire drawing file and attempt to separate all composite entities (for example, polylines, blocks, and so on) into individually selectable graphical entities (such as lines). Any arcs in the drawing will be automatically converted into a series of straight lines that LANPlanner Solo can use in predictions. It will also remove all references to unused blocks and empty drawing layers.

During the course of this procedure, certain drawing entities may seem to disappear. They have not been deleted from the drawing file, but may have moved to a hidden or invisible drawing layer as a result of having been separated from the block or composite entity they were members of. Note also that door arcs present on any layer with the word “door” in it will be automatically converted to doors. This process may require several minutes, depending on the size of your drawing file.

The main list box in this dialog displays all the layers that are present in the AutoCAD file. Formatting an AutoCAD file involves going through the list of layers and deciding which ones have significant RF obstructions and need to be kept and which ones are not significant and can be safely removed. Double clicking on a layer causes the other unformatted layers to be hidden so you can see what is on that layer.

By default, any layers that you have already formatted continue to be displayed so you can see how the selected layer fits in with the rest of the drawing. After double-clicking a layer to hide everything else, it is important to note that formatted layers will remain visible, but you can choose to hide them by clicking the icon in Figure 4.24.

Figure 4.24: Format CAD Drawing: Hide formatted partitions icon

If you decide that the layer does not contain any useful data (e.g. the layer has nothing on it but AutoCAD dimensions, office furniture, or some other item that does not affect RF signals) you can click the button shown in Figure 4.25 to remove all the entities on that layer.

Figure 4.25: Format CAD Drawing: Delete all entities on a particular layer

If the layer does contain significant RF attenuating structures such as walls, doors, glass, tall and heavy objects, then you need to convert them to one of your current partition categories. There are two ways to do this. The easiest is to right click on the layer you wish to convert. This displays the popup menu similar to the one seen in Figure 4.26. Choose one of the **Convert to** menu options to convert the entities in that layer to the given partition type.

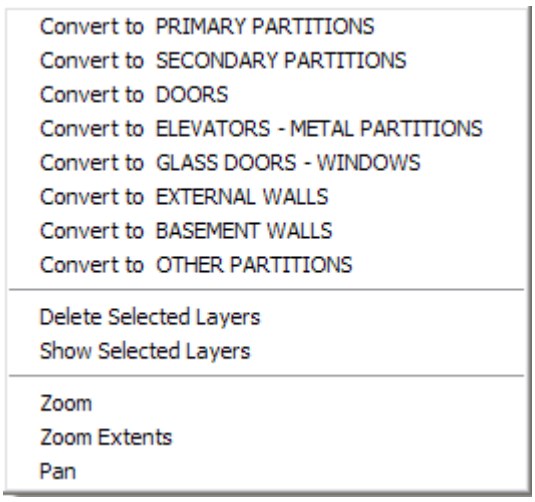


Figure 4.26: Format CAD Drawing: Right click popup menu for processing layer selections

The other method is to select the layer you wish to convert and then use the controls in the **Automatic Layer Processing** group to convert the layer (Figure 4.27). You can specify the height of the partition when formatted (to make cubicles, for example) and the partition type the layer will become. Pressing the **Process Selection** button will covert the layer.

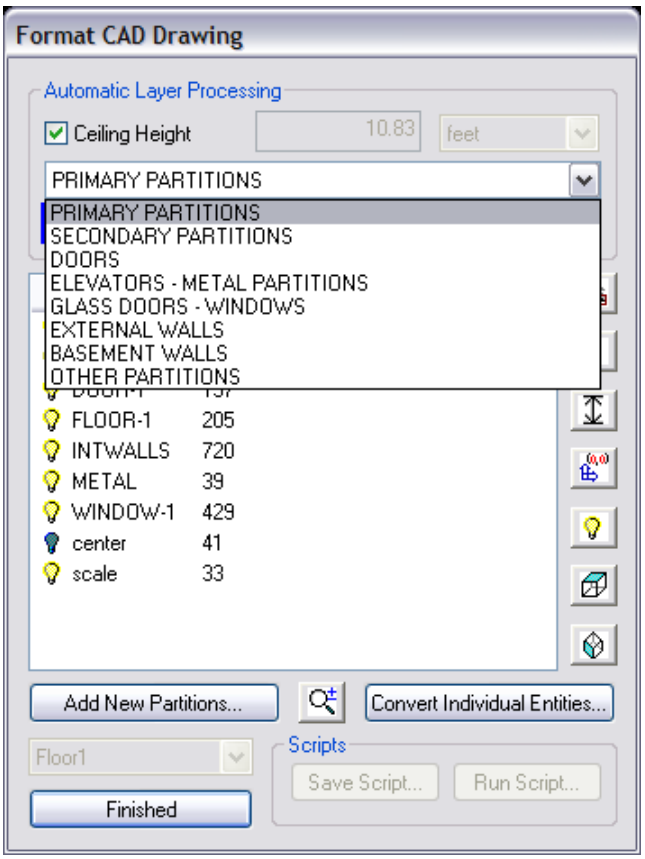


Figure 4.27: Format CAD Drawing: Automatic Layer Processing group

As the layers are formatted, they will disappear from the main list box. If you format a layer and it does not disappear from the list box then there are some entities left on that layer that are not lines and can not be processed. You can use the icon shown in Figure 4.24 to hide and show the formatted building data. This is useful when you cannot distinguish the difference between formatted information and some lines on an unformatted layer.

Figure 4.28 below shows further useful icons on the Format CAD Drawing dialog:

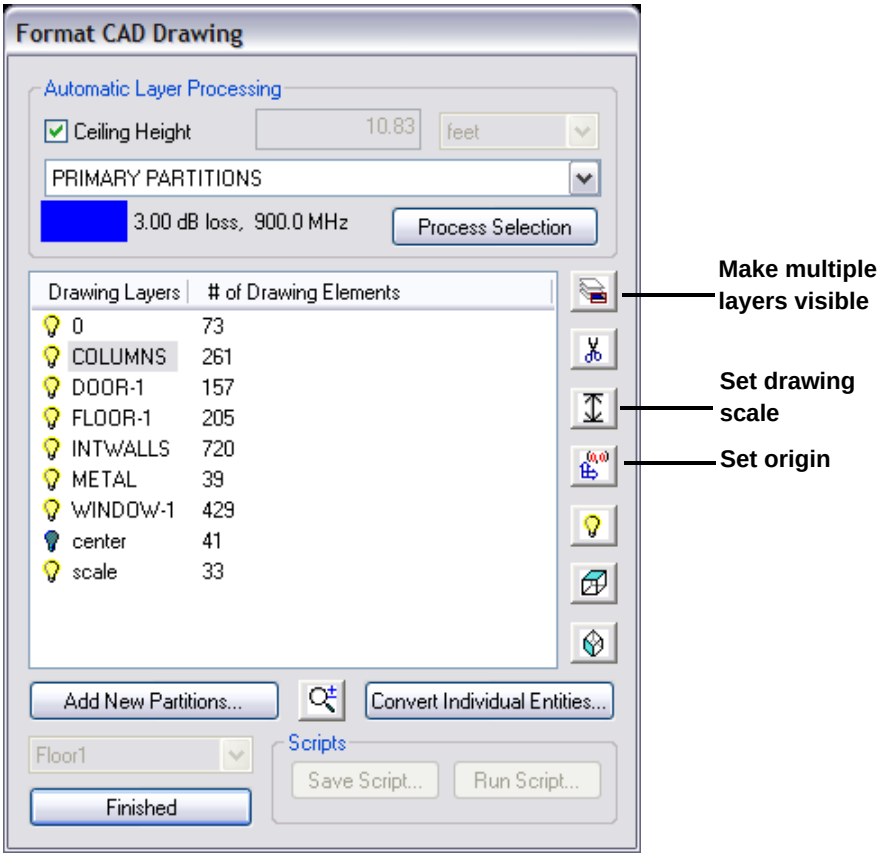


Figure 4.28: Format CAD Drawing: Scaling, Origin, and Layers Visible icons

The **Add New Partitions** button displays a dialog that allows you to draw completely new walls (see “Drawing Partitions” on page 86). Convert Individual Entities displays a dialog that allows you to select individual lines in the AutoCAD file and convert them to partitions that can be used by LANPlanner Solo’s predictive engine (see “Change Partition” on page 89). This is useful when there is more than one wall type in a given layer.

Drawing Partitions

The primary way of creating partitions is by using the **Draw Partition** dialog shown below. The Draw Partition dialog may be activated by choosing the **Format Building > Draw Partition** menu command.

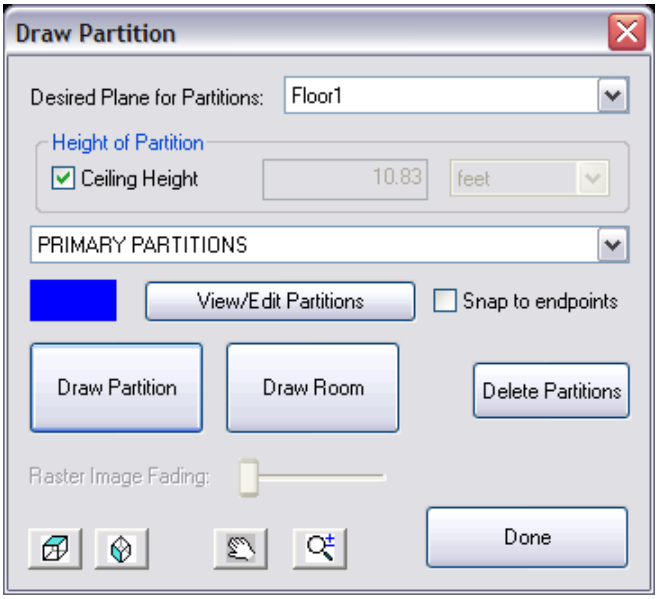


Figure 4.29: Draw Partition Dialog

- **View/Edit Partitions** - Provides access to the **Set Propagation Parameters** dialog box (see “Setting Propagation Model Parameters” on page 183). Use the **View/Edit Partitions** button to examine or change partition attenuation factors.
- **Draw Partition -** This button allows you to add partitions. To do this, select the desired partition type from the pull-down list in the dialog box and then click the **Draw Partition** button. The pull-down list displays the eight partition types you choose within **Format Building** > **Current Partition Categories** (see “Current Partition Categories” on page 90).

  LANPlanner Solo allows you to place partitions by clicking in the drawing with the mouse cursor. Left click to start drawing a partition, and left click in another location to complete the partition. If you continue to left click in successive locations, a continuous series of walls will be drawn. Right click (or press the **ESC** key) to begin an unconnected string of partitions elsewhere in the building. Right click twice (or press **ESC** twice) to return to the **Draw Partition** dialog box.

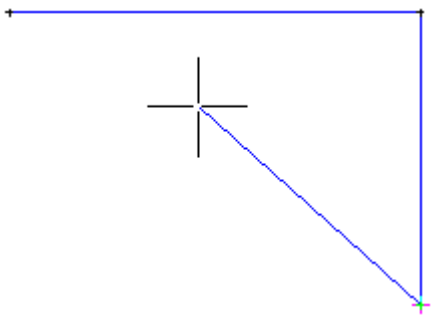


Figure 4.30: Drawing partitions

- **Draw Room -** Allows you to draw rectilinear rooms with square corners. To do this, select the **Draw Room** button, then click in the drawing to indicate one corner of the room, then click again to indicate the opposite corner.
- **Delete Partitions** - This button provides a way to undo partitions you have drawn. Each time you click Delete Partitions, a previously drawn partition is deleted, starting with the most recently drawn partitions.
- **Snap To Endpoints** - This checkbox helps you to draw partitions that join properly with no gaps between walls. When the Snap To Endpoints checkbox is selected, and you are drawing partitions, a colored box highlights the end of previously drawn lines when your cursor is nearby (see Figure 4.31, below). If you click your mouse while the end of a nearby line is highlighted, the software will behave as though you had in fact clicked exactly on the end of the nearby line, thereby creating perfectly joined partitions with no gap.

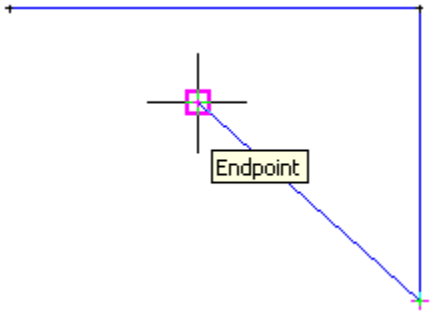


Figure 4.31: Snap to endpoint

- **Raster Image Fading -** When using imported raster images, you must use the partition drawing tool to ‘trace’ over the image where the partitions appear. You can make raster images dimmer, and therefore make it easier to see what you have drawn, by using the Raster Image Fading slider bar.

You can change the viewing perspective, or zoom or pan to look at a different part of the drawing by using the buttons on the bottom left of the **Draw Partition** dialog box (see Figure 4.32).

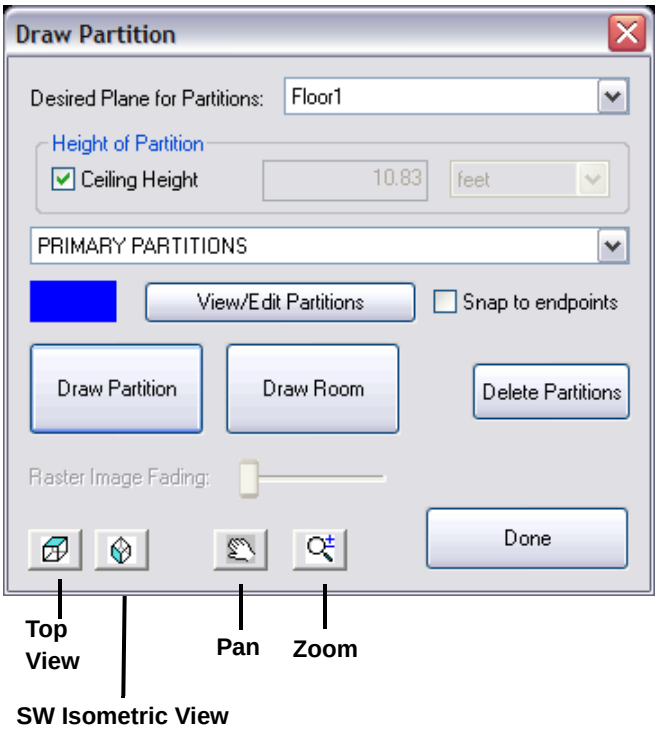


Figure 4.32: Viewing perspective buttons

When finished drawing new partitions, click **Done** to exit the **Draw Partition** dialog.

Drawing Tips

The main LANPlanner Solo window has quick access buttons at the bottom of the screen that can aid the process of drawing. The figure below shows the **ORTHO** and **OSNAP** buttons at the bottom right of the main program screen.

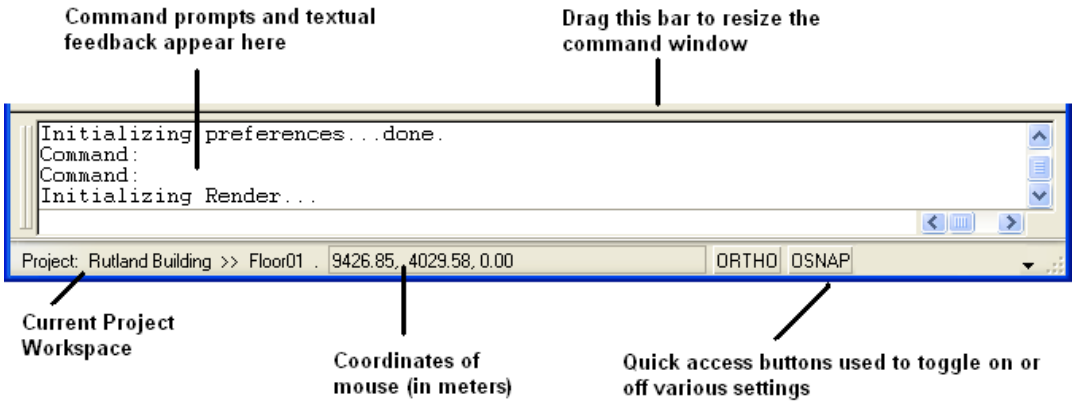


Figure 4.33: GUI command line

The quick access buttons, when left-clicked, toggle the **Orthogonal** cursor mode and **Object Snap** on and off. A given mode is on if the command is displayed in bold text. Otherwise, it is off. Settings for each command may be accessed by right clicking on the button.

Object snap is a useful tool for adding partitions. To accurately connect drawing objects such as walls, the cursor movement may not be steady enough. To assist users, object snap provides several commands that can manually or automatically connect drawing objects to other objects at end points, quadrants of circles, perpendicular intersections, and many other points of interest. To configure automatic object snap, click on the OSNAP button on the status bar and configure using the subsequent dialog box. Object Snap can be toggled on and off by clicking the OSNAP button on the status bar.

Since most partitions are either vertical or horizontal on the screen, you need to be able to put the software in a mode that forces the cursor to draw partitions vertically or horizontally. LANPlanner Solo provides a command that handles this task. Clicking the word ORTHO on the status bar toggles ORTHO mode. ORTHO mode forces the cursor to place objects in a drawing either horizontally or vertically.

Change Partition

The **Format Building** > **Change Partition Type** command is used to covert existing formatted partitions into a new partition type. This command can also be used to change already formatted partitions into a different type of partition.

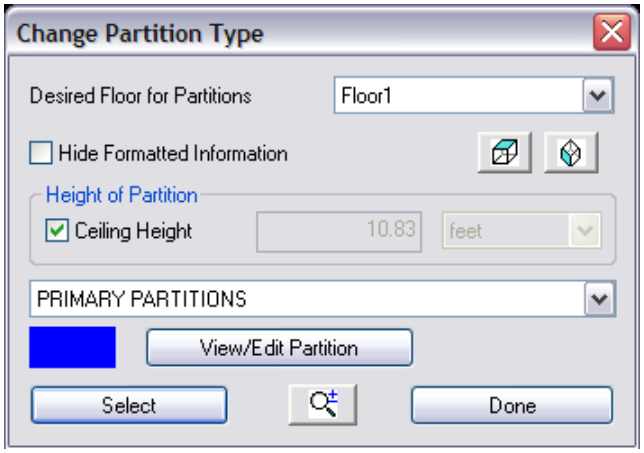


Figure 4.34: Change Partition Type dialog

This dialog lets you pick a new partition type to assign to one or many partitions on the drawing.

After selecting this menu command, you will be prompted to select the new partition type and the floor upon which the changed partitions should appear. Keep in mind that all of the selected objects will be formatted to one of the choices available in this dialog box and all of the objects will be placed on the floor specified in the combo box at the top of the dialog box. After clicking **Select** you have the option of selecting one or many objects by clicking them with the cursor. Alternatively, you can use more drawing aids such as windows or fences to select several objects. To exit the selection mode and return to the Change Partition Type dialog, press the **ESC** key.

Current Partition Categories

LANPlanner Solo ships with default names for partitions and default colors for partition objects. Selecting **Format Building > Current Partition Categories** allows you to select the eight partitions used for the current drawing.

NOTE

You were already given the opportunity to select your eight partitions when creating a the project workspace with the Project Workspace Creation Wizard. ***Changing the partitions here may change the partitions assigned to Category 1, for example, from drywall to something else. However, you can always change it back.***

The **Current Partition Categories** dialog is shown below. This dialog lets you select the current eight partitions used in the drawing.

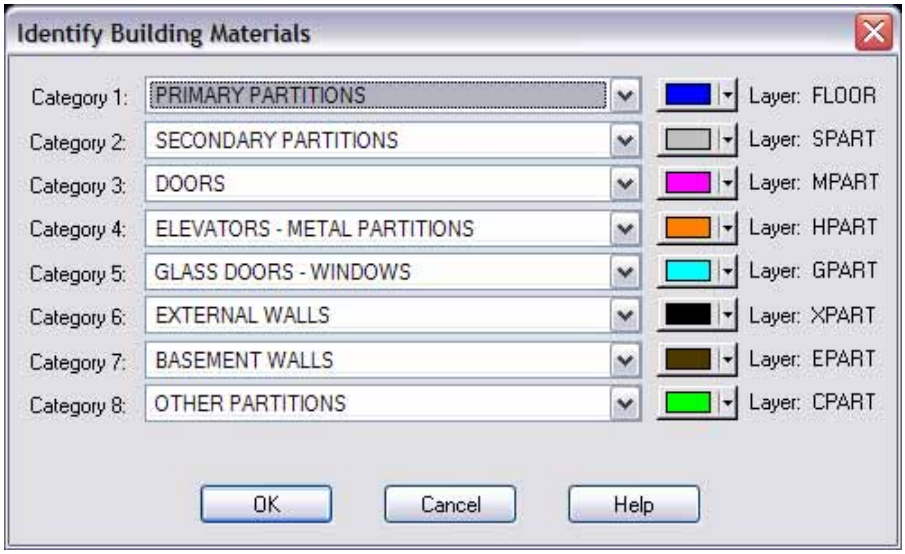


Figure 4.35: Current Partition Categories dialog

To change a partition category, select a new partition from the drop down list:

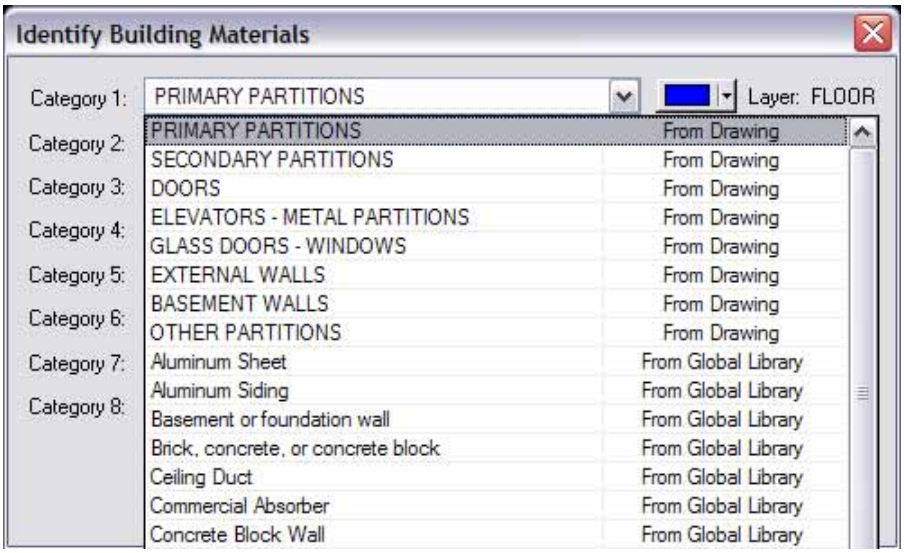


Figure 4.36: Changing a partition category

To change the default color for that category, click on the color square next to a partition category:

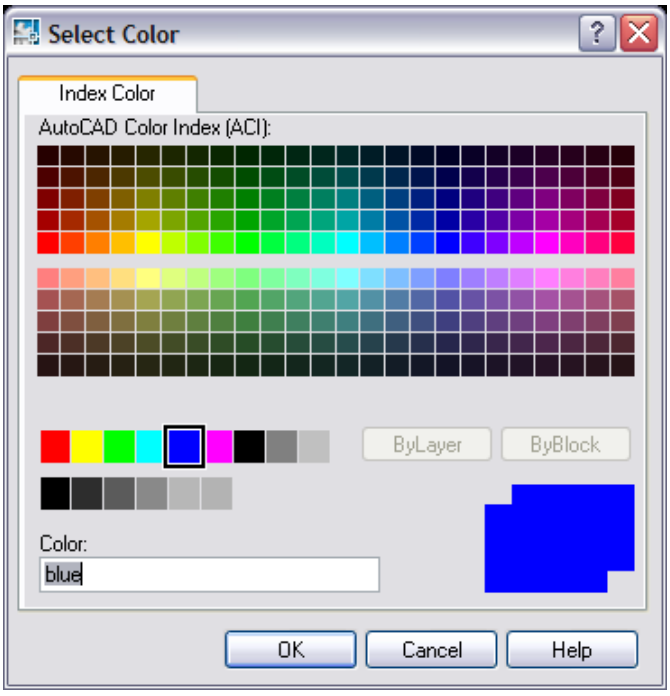


Figure 4.37: Selecting a partition color

Editing the Partition Library

Although LANPlanner Solo comes with default names for partitions and default colors for partition objects, they are configurable to fit your specific needs. Selecting **Format Building > Edit Partition Library** opens the dialog box below, which lets you create and edit partition types.

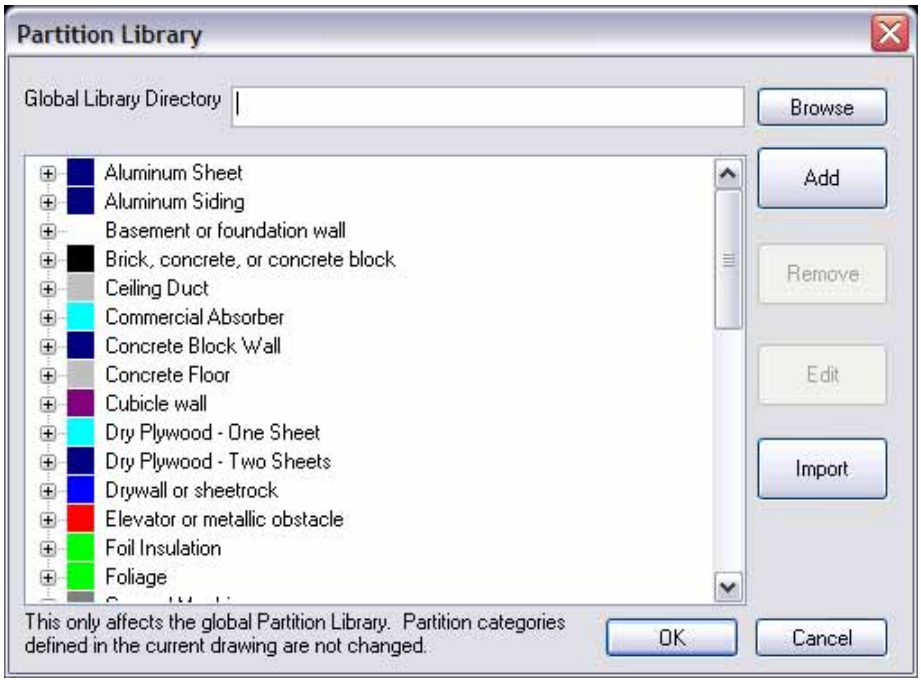


Figure 4.38: Partition Library dialog

The **Partition Library** dialog assists you in customizing the color, attenuation values, and name of each type of partition. This dialog also allows you to determine the location of your global partition library file. You can use the text box at the top of the dialog or the **Browse** button to enter a directory where the software should store the partition information. This can be used to share one copy of the partition library with several installations of LANPlanner Solo.

Selecting the "+" sign next to a partition expands its list of frequencies and attenuation values:

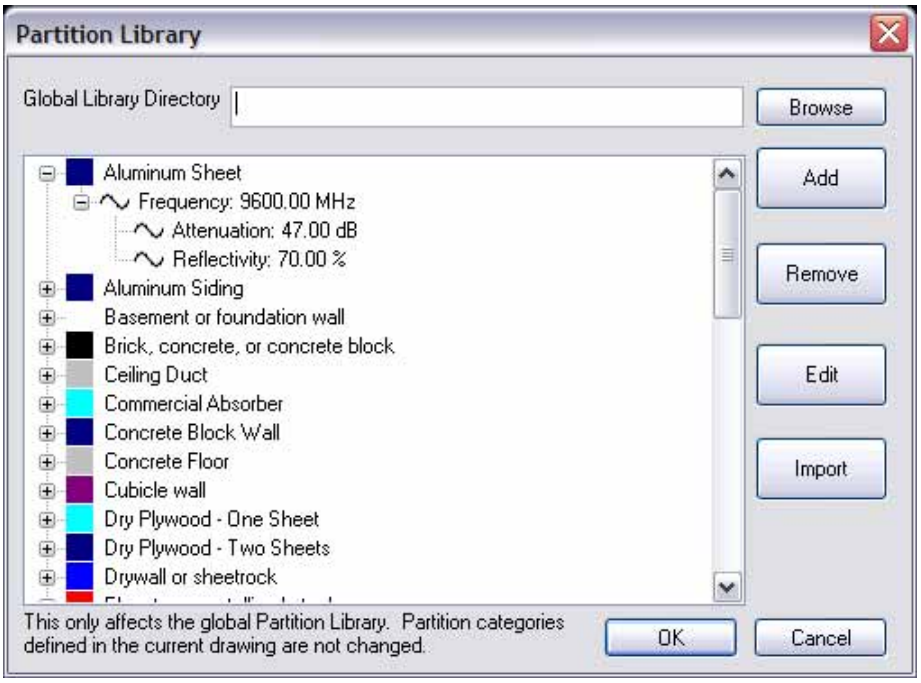


Figure 4.39: Partition Library details

The **Partition Library** panel includes the following options:

- **Global Library Directory** - You can use the text box at the top of the dialog box or the Browse button to enter a directory for storing the partition information. This can be used to share one copy of the partition library with several installations of LANPlanner Solo, for example, on a centralized file server.
- **Add** - Allows you to add a new partition category (see Figure 4.40, below):

NOTE

Changes made in the Partition Library only modifies the global library, not the partitions in the current drawing. If you want to update partitions in the current drawing, you can change the global library but you have to open ***Format Building > Current Partition Categories*** *and select one from the global library (see "Current Partition Categories" on page 90).*

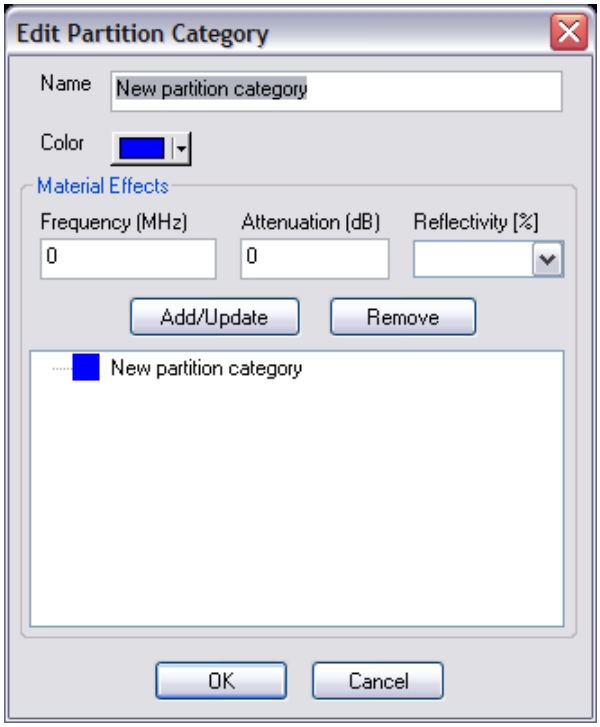


Figure 4.40: Adding a new partition category

- **Remove** - Allows you to delete the selected partition category. Selecting this option opens a prompt dialog confirm the partition category delete.

- **Edit** - You can change the value for a frequency, add a new frequency, rename the partition category, or change the attenuation value for a frequency. The attenuation value is the reduction in signal strength (dB) for the specified frequency due to the partition material.

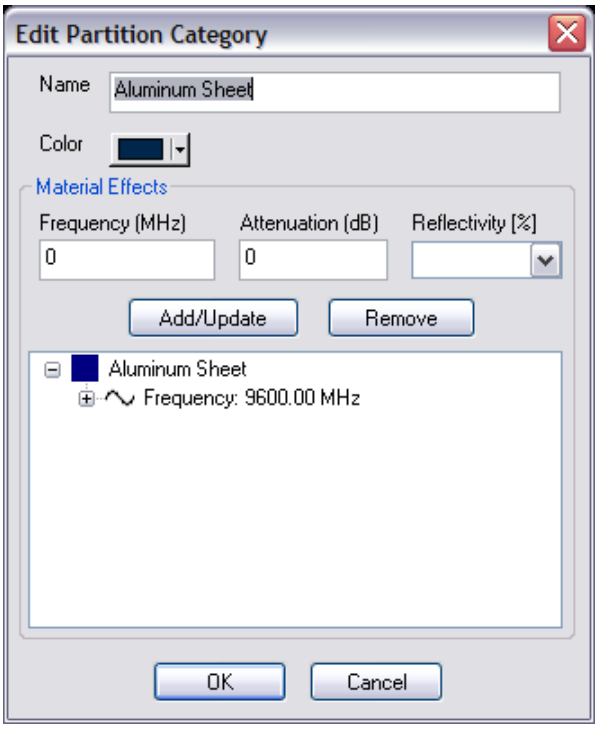


Figure 4.41: Editing a Partition Category

- **Import** - There may be instances when you need to import partition category information from another partition library (.xml file) or a propagation parameter file (.xpt file). Selecting the import button from the Partition Library dialog opens the **Partition Import Filter** (Figure 4.42), which provides you the option to chose the source file by using the **Browse** button. You can import all the partition information, or import only specific ones by selecting the **Remove** button to filter out unwanted partitions.

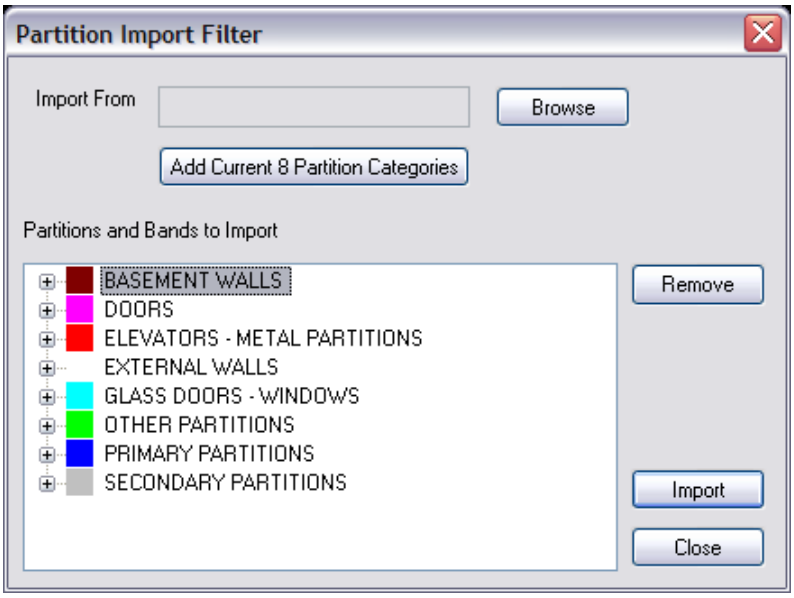


Figure 4.42: Partition Import Filter

Scale Drawing

Scaling the drawing is very important because the drawing must represent the actual real life size of the partitions to ensure that predictions accurately model the real world. Scaling the drawing normally occurs in the Building Floor Manager via the Format Floor Wizard or Edit Floor dialog, but it may also be performed from the **Format Building** > **Scale Drawing** command.

If you choose to scale the drawing from the Format Building menu, you have the additional functionality of choosing whether to scale the entire drawing, the current floor, or individual drawing entities. Your choice is made in the Scale Drawing dialog box below:

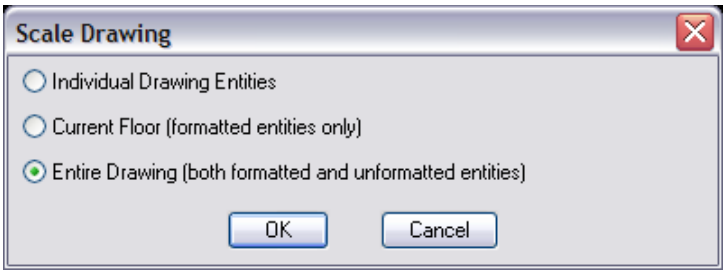


Figure 4.43: The Scale Drawing dialog box

After you click **OK**, the software will prompt you to select two points and then you will be prompted to enter the physical real world distance between those points. Once the points have been selected and a distance has been entered, the software will automatically scale the corresponding objects (**Individual, Current Floor, Entire Drawing)** and refresh the drawing display.

A Completed Site-Specific Model - Viewing Buildings in 2D and 3D

This section presents examples of final building models processed through LANPlanner Solo's **Format Building** functions. In the examples below, you can match the partition colors in the building diagram to the Partition Categories in the **Legend Data** window to determine the material type. The unique RF attenuation properties of these materials will be used by the prediction engine to simulate wireless signal coverage during **Network Design** (Chapter 5) and **Network Verification** (Chapter 6).

Toggling Between Floor Views

By default, the LANPlanner Solo displays the first floor of the building model in 2D.

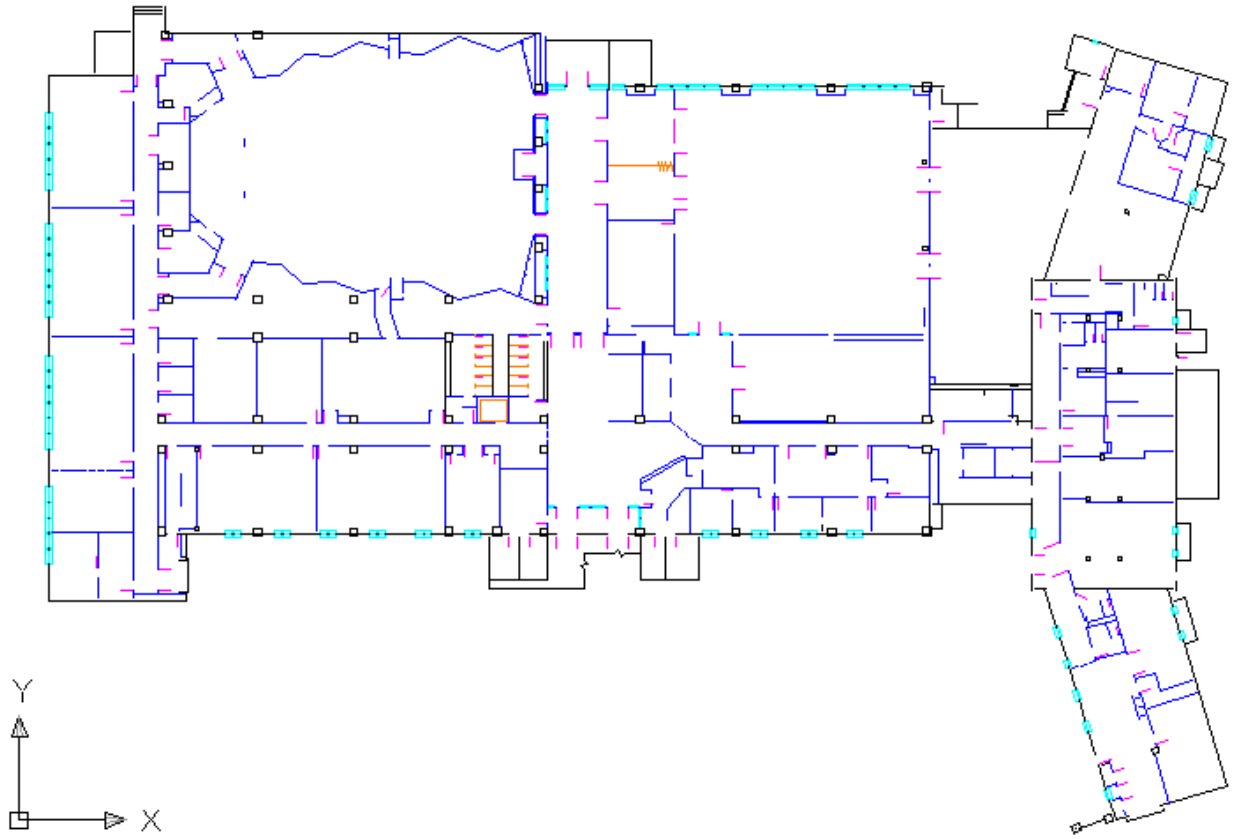


Figure 4.44: Completed Site-Specific Model

If your building or facility contains multiple floors, you can switch the view to a different floor by using several different methods:

- Hotkeys (**F5** up one floor, **F4** down one floor)
- Through the **View** menu from the LANPlanner Solo toolbar:

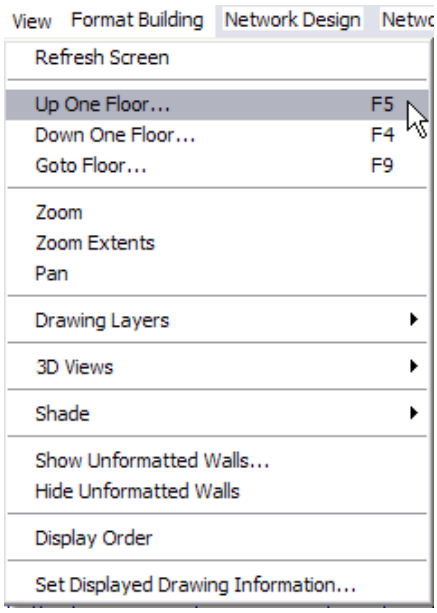


Figure 4.45: Switching floors through the View menu

- By explicitly using the Goto Floor hotkey (**F9**), which opens the **Goto Floor** dialog in Figure 4.46, below.
- By selecting **View > Goto Floor**, which also opens the **Goto Floor** dialog in Figure 4.46, below:

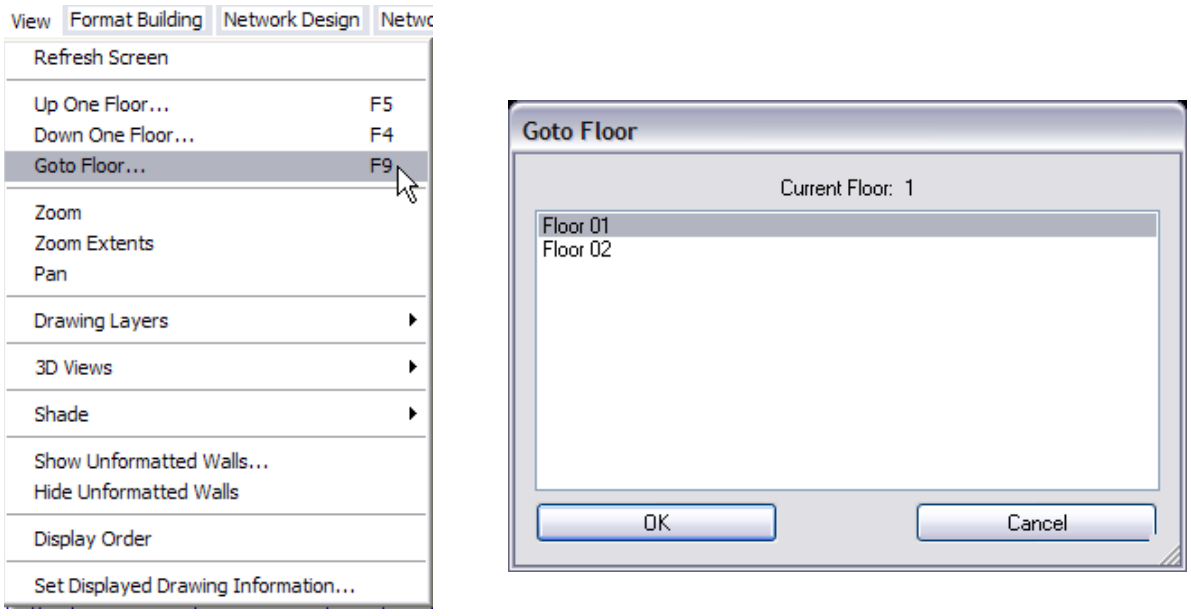


Figure 4.46: Selecting which floor to view

- You can also toggle floor selection by using the **Current Floor** link in the **Legend Data** window:

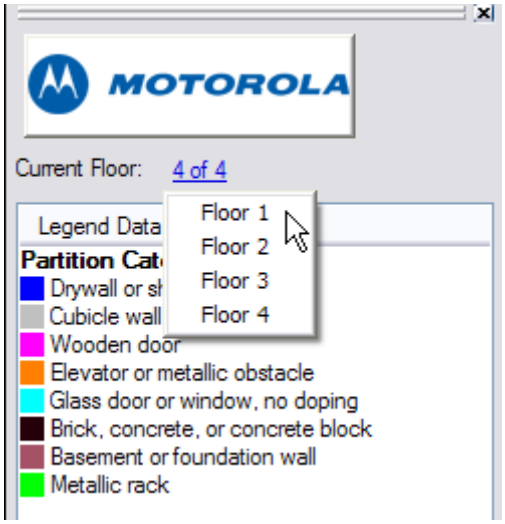


Figure 4.47: Selecting floors from the Legend Data window

Viewing In 3D

The best way to get a full perspective of RF obstructions is to view your building model in 3D.

LANPlanner Solo's virtual environment models are inherently three dimensional. By default, the ceiling heights you specify are used to determine the vertical height on a given floor. If a partition resides on floor two of a building, the ceiling height of floor two is used to determine the height of the partition, unless otherwise specified by you while drawing the partition. This is done automatically for you during the formatting process. Thus, when you have finished formatting a drawing using Format Building, even though the formatting process was strictly two dimensional, the final drawing is a true 3D site-specific model.

You can see the three-dimensional building structure by selecting **View > 3D Views > SW Isometric**. To return to the 2D view, select **View > 3D Views > Top**. A building that has been fully formatted and displayed in SW Isometric View with **View > Shade > Flat Shaded, Edges On** enabled is shown below:

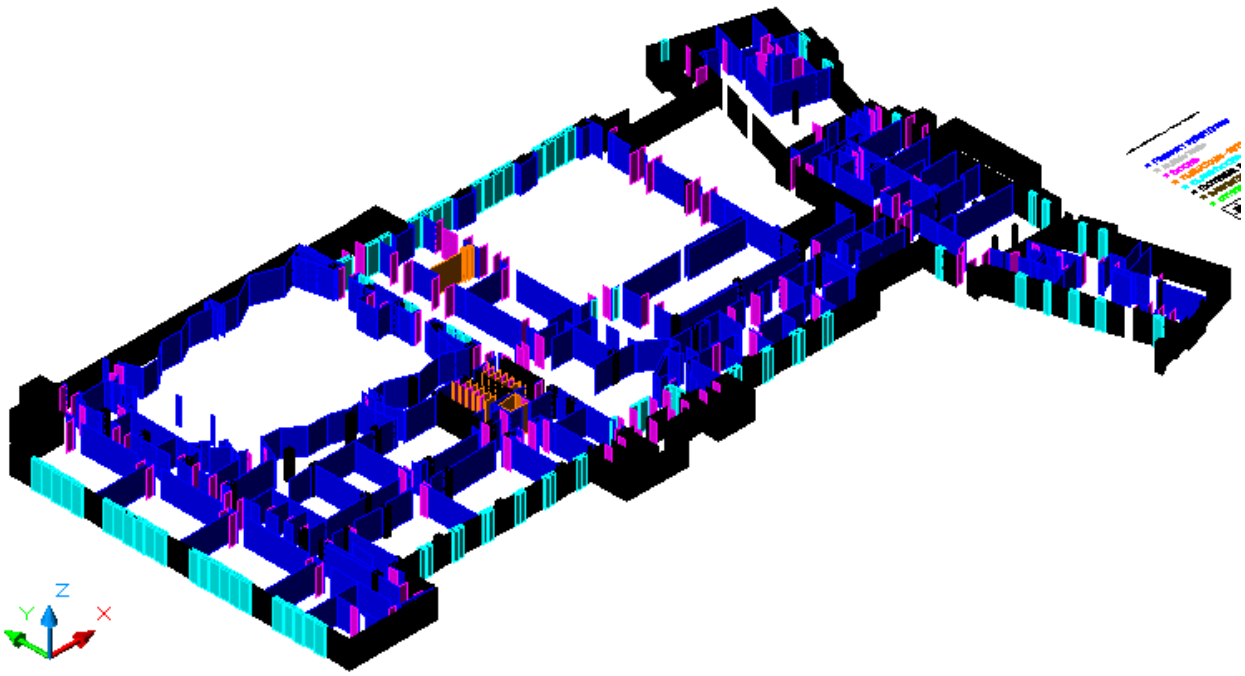


Figure 4.48: 3D SW Isometric view

You can also view your building model in 2D wireframe mode by selecting **View > Shade > 2D Wireframe**. 2D wireframe makes walls transparent and only displays their outline. This feature is optimal if you want to see through a wall. 2D wireframe mode also causes the drawing to renders faster, as opposed to using **View > Shade > Flat Shaded, Edges On**. 2D wireframe mode is also the only view in which lineweight is displayed.

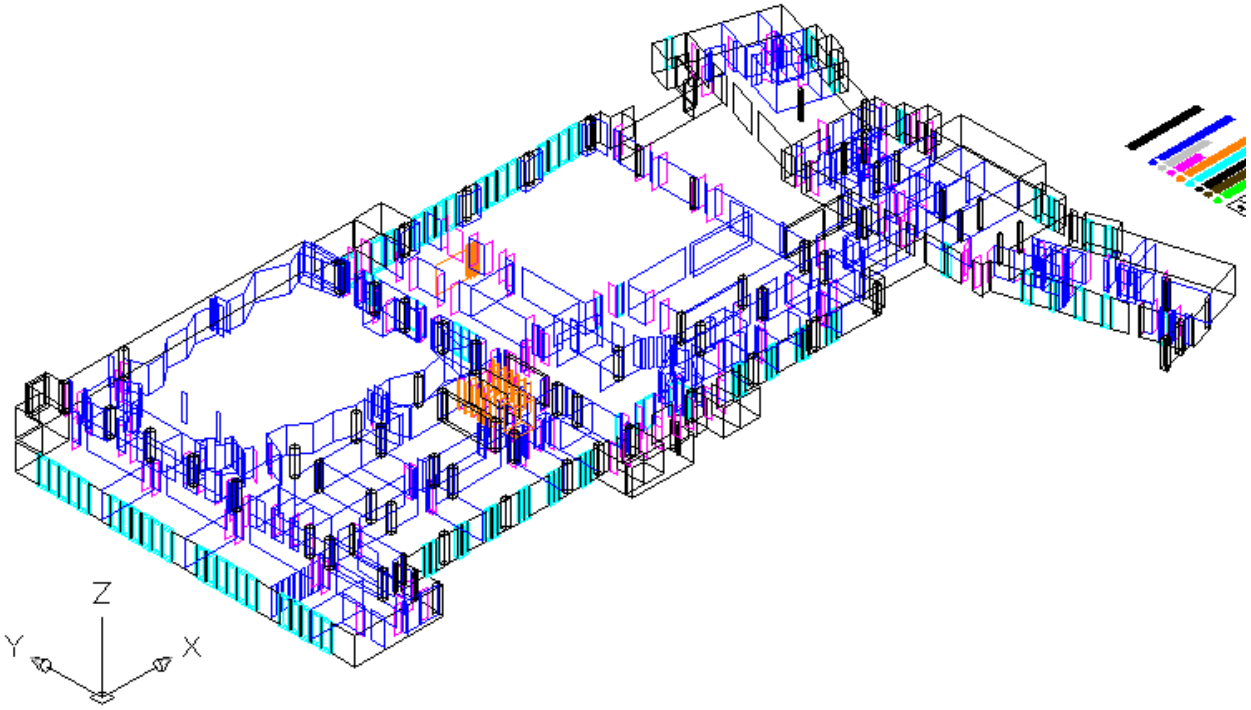


Figure 4.49: 2D Wireframe view

Selecting **View > Shade > Hidden** makes “hidden lines” invisible while displaying a drawing in 3D. “Hidden lines” refer to lines in a drawing that would not be visible if the objects in the 3D drawing were visualized in real-life, true 3D.

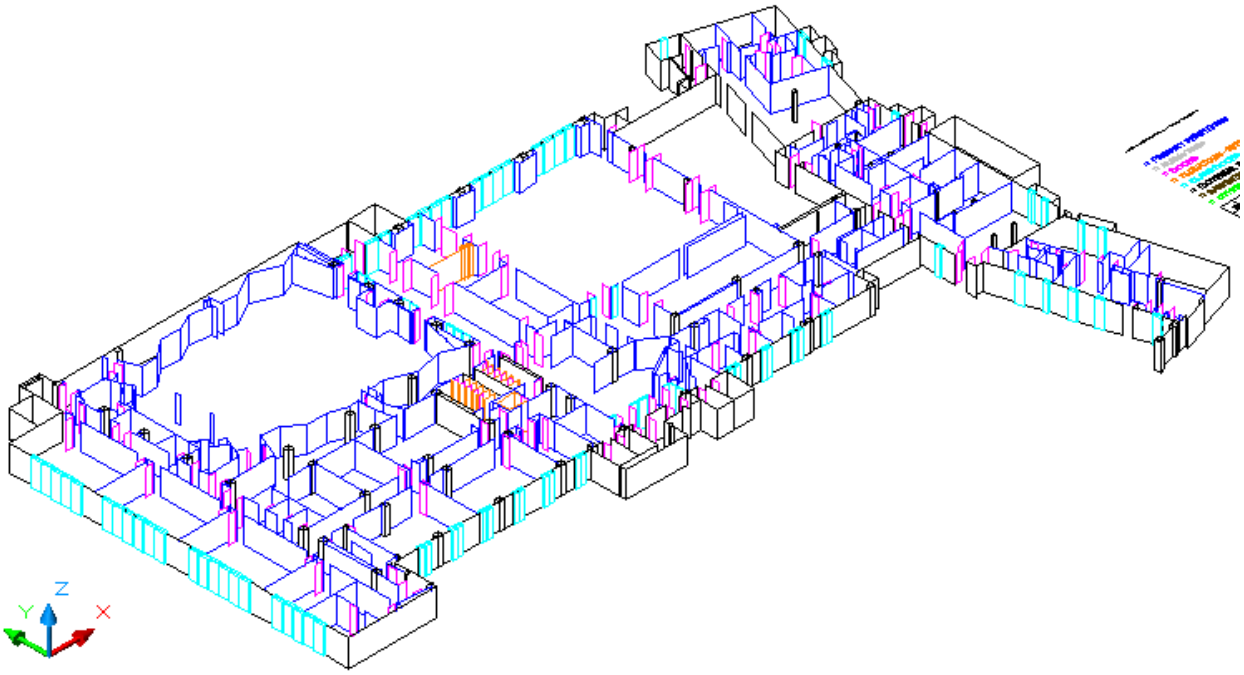


Figure 4.50: Hidden lines invisible

5 Network Design

Introduction

After modeling your building or campus environment using the tools under LANPlanner Solo's **Format Building** menu, you are ready to begin wireless network design. The **Network Design** menu provides the functionality for placing equipment such as access points and sensors in your facility and predicting system performance.

NOTE

For LANPlanner Solo users: *The Network Design menu remains locked until you open a drawing file received from Motorola that contains the appropriate key. After completing your facility model using the Building Wizard, you will be prompted to email the drawing to rfsoftwaresupport@motorola.com. Upon receipt, Motorola will attach a key to the drawing file which unlocks the Network Design menu, enabling you to place hardware and run RF predictions.*

From within the **Network Design** menu, you can manually or automatically place access points and sensors, and then predict wireless network coverage and capacity. You can also position the access point/sensor, choose the air interface standard and assigned channels, and if you use the Quick Start AP Placement feature, specify the user locations and data rate requirements. After hardware placement and prediction, you then graphically view the results in LANPlanner Solo to visualize coverage and when satisfied with the results, generate a complete bill of materials for costing your design

Network Design Workflow

The workflow diagram in Figure 5.1 below provides an overview of the primary Network Design steps for selecting, placing, and configuring access points/sensors.

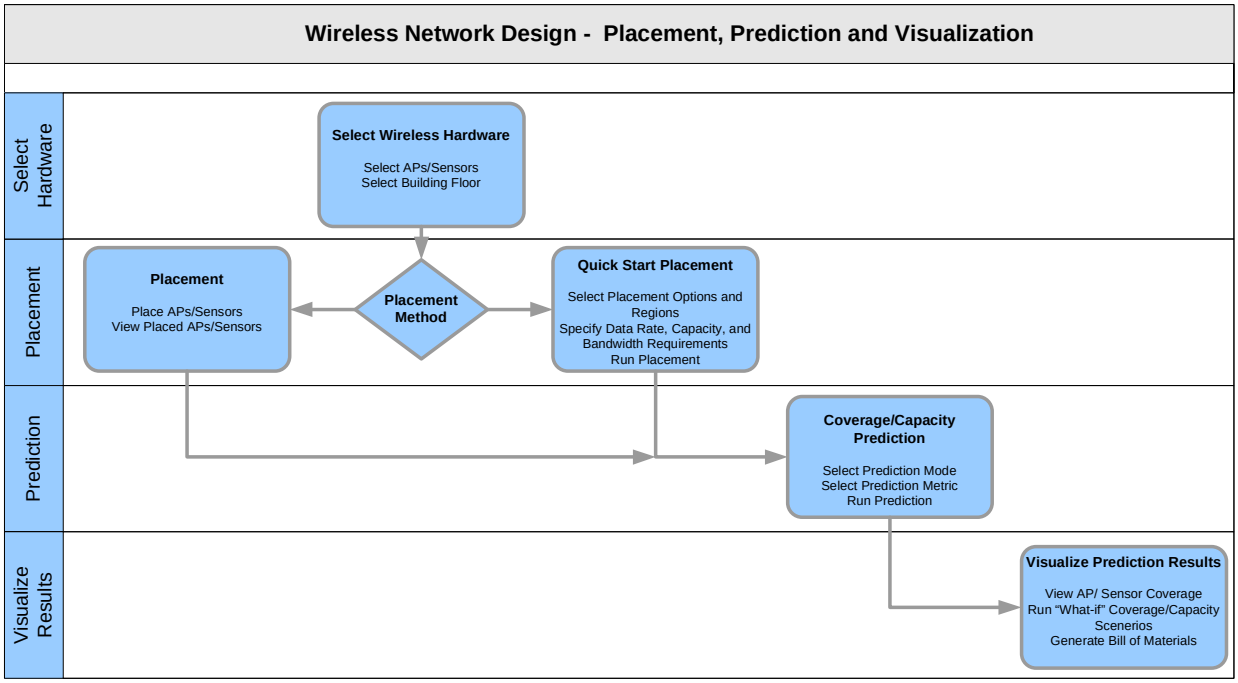


Figure 5.1: Network Design Workflow

Managing Access Points

Access Point Placement

Selecting **Network Design > Place Access Point** displays the **Place Access Point** dialog (shown in Figure 5.3). This dialog allows you to directly place hardware equipment at a desired location in the drawing by clicking in the drawing at the location you want to locate the hardware. Another option is to run automatic access point placement (see “Quick Start Access Point Placement” on page 108).

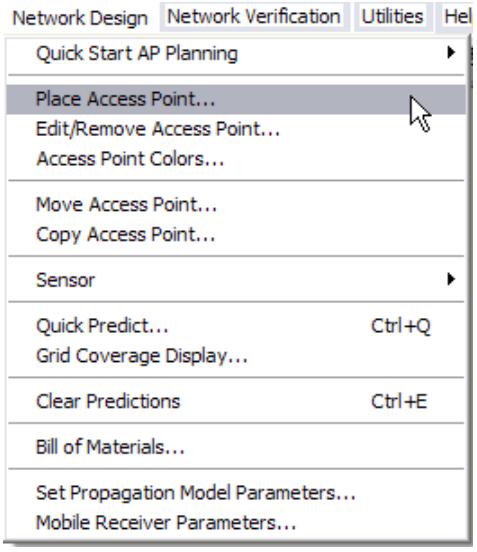


Figure 5.2: Selecting Access Point placement

To place hardware in the drawing, double left click the hardware description in the **Place Access Point Dialog** and then left click at the location in the drawing where you would like the access point placed. If the access point you are placing has antenna's that are attached via cables, then click again in the drawing to specify the location of the antenna relative to the access point. You may continue to place multiple access points by clicking in the drawing again.

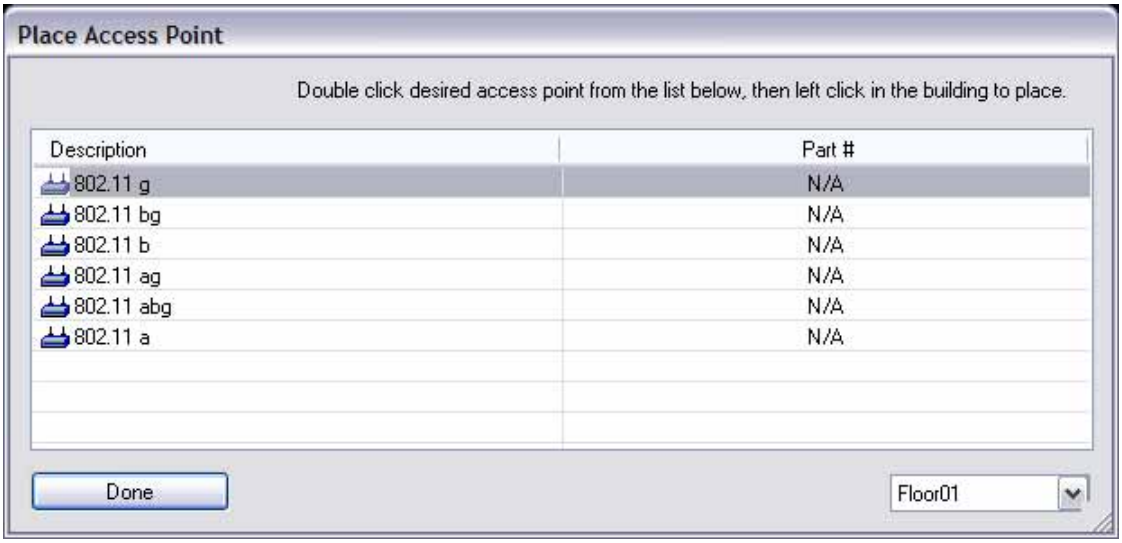


Figure 5.3: Place Access Point dialog

To place access points on a different floor, use the floor drop-down menu located on the lower-right side of the **Place Access Point** dialog to change the floor currently displayed in the drawing.

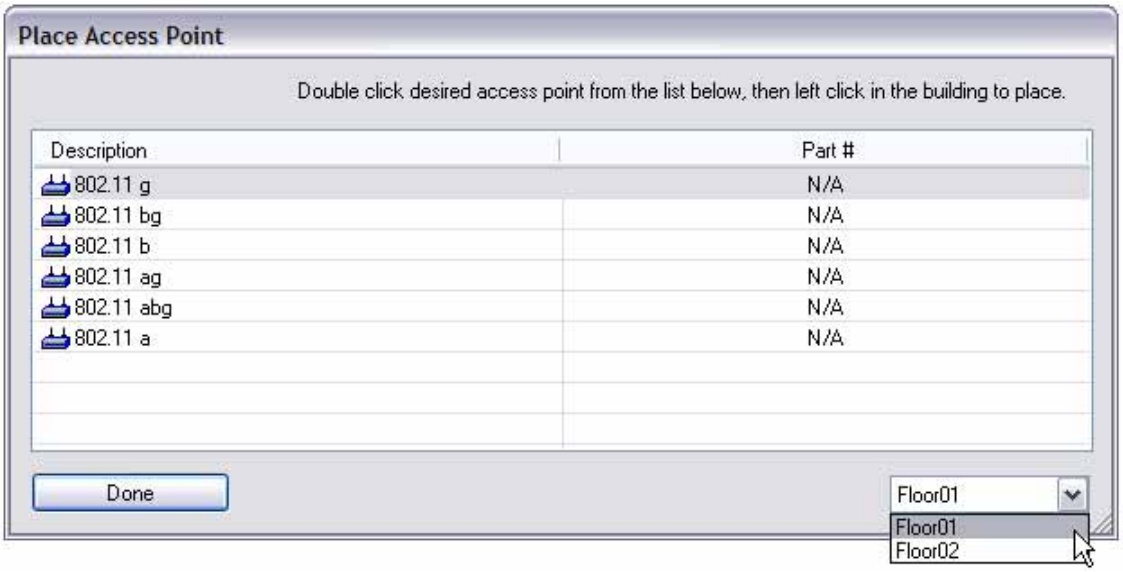


Figure 5.4: Selecting a floor

To exit manual placement, press the **ESC** key, which will return you to the Place Access Point dialog.

The example below shows the result of manual access point placement. Note that when you place the mouse cursor over an access point or right-click, a tool tip window provides details about the access point hardware:

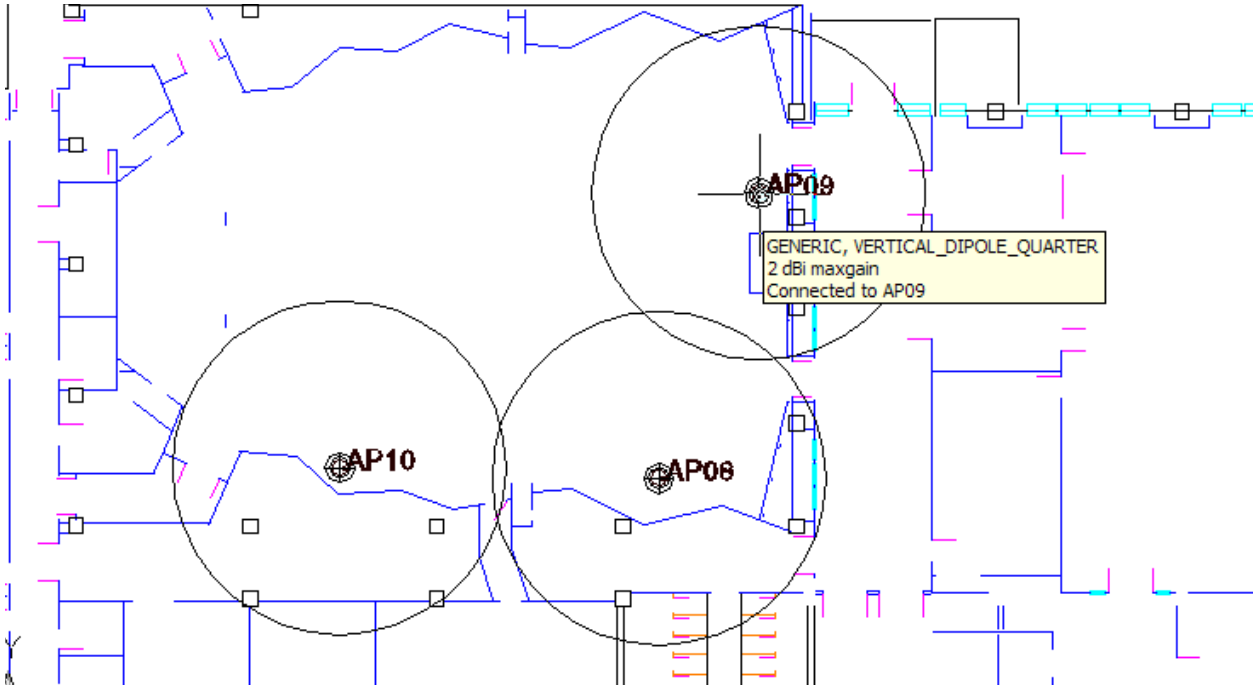


Figure 5.5: Placed Access Points

Once you are satisfied with access point placement, you are ready to configure the channel and power settings (see “Running Quick Prediction” on page 151).

Quick Start Access Point Placement

LANPlanner Solo includes the ability to automatically place and configure access points in the building model to satisfy your unique coverage and capacity requirements.

Selecting **Network Design > Quick Start AP Placement** opens the Select Access Point Model dialog:

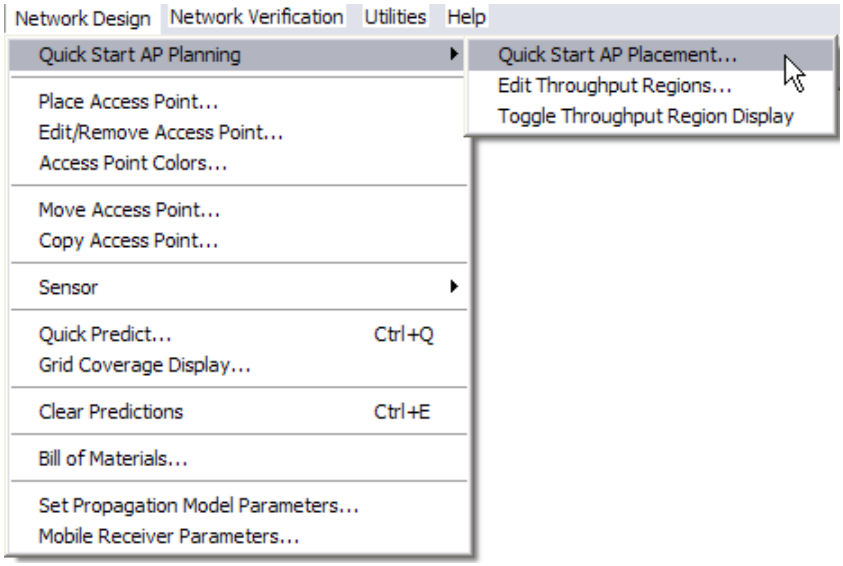


Figure 5.6: Selecting Quick Start AP Placement

The first step in automatic placement is to choose the access point type. The **Place Access Point** dialog (see Figure 5.7) allows you to choose which type of hardware will be used to provide coverage. Select an access point from the listbox then press **Next** to continue. Alternately, you can double-click the access point.

NOTE

All access point air interface standards, configuration, parameters, and prediction results depend on the access point that you select from this dialog.

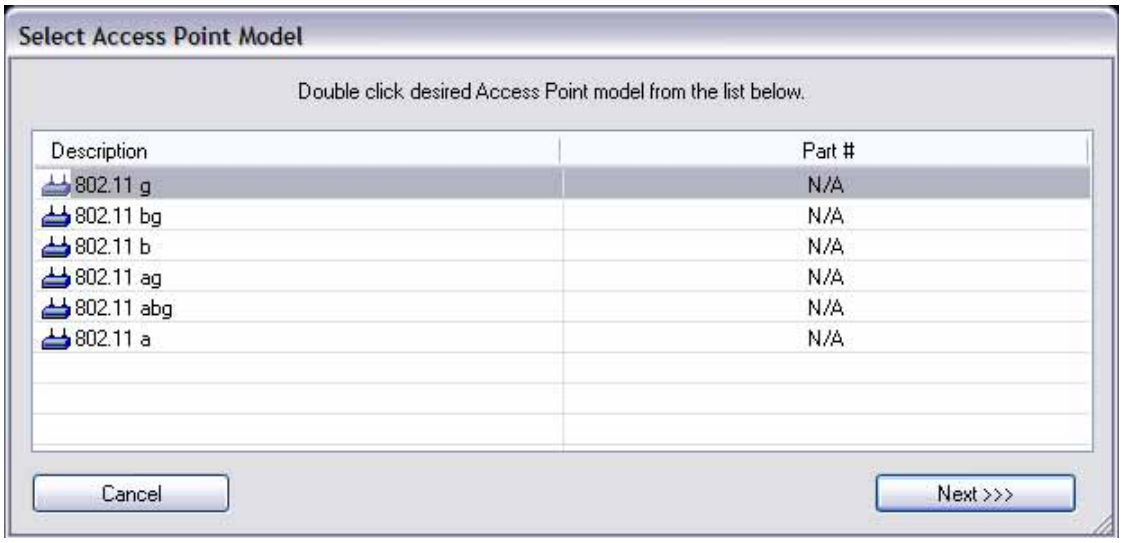


Figure 5.7: Place Access Point dialog

Global Auto-Placement Options

After you choose an access point, LANPlanner Solo displays the global configuration options window shown below. The parameters you select from this dialog apply to all access point requirement regions specified during the auto-placement process.

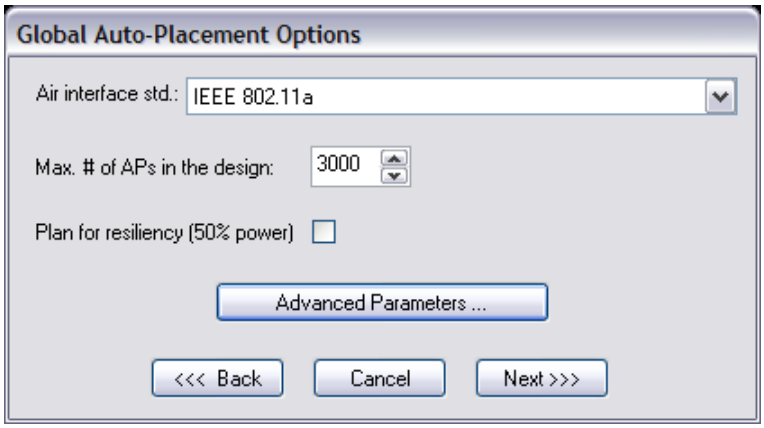


Figure 5.8: Global Auto-Placement Options dialog

- **Air Interface Standard** - The air interface standard is the standard for which LANPlanner Solo will base placement optimization on. It helps to determines the number of access points placed and the appropriate configuration for each. If the chosen access point supports more than one standard, LANPlanner Solo uses this setting to select appropriate power settings, throughput capabilities, and frequency-dependent propagation parameters.

- **Maximum Number of Access Points** - Change the maximum number of access points in the design to account for hardware limitations in the deployment. This setting limits the total number of access points placed by the wizard. If access points already exist in the design, these are taken into account when calculating this limit.
- **Plan for resiliency** - Many deployments require the designer to plan for coverage resiliency by planning access point power settings well below the maximum threshold. In the event an access point goes down or becomes unavailable, coverage holes can be minimized by increasing the available power of other access points.

  LANPlanner Solo allows the user to plan access point placements based on 50% of the maximum available power. The result is that the automatic placement wizard places more access points in the design and configures power settings at or below 50% of the maximum power allowed.
- **Advanced Parameters** - See “Advanced Global Auto-Placement Options” on page 110.

After completing the **Global Auto-Placement Options** dialog, select **Next** to open the **Specify Client Location and Requirement Regions** dialog (see Figure 5.10).

Advanced Global Auto-Placement Options

You can use the Advanced Global Auto-Placement Options dialog to fine-tune the network performance requirements that LANPlanner Solo will use during Quick Start AP Placement. The parameters you select from this dialog apply to all access point requirement regions specified during the auto-placement process.

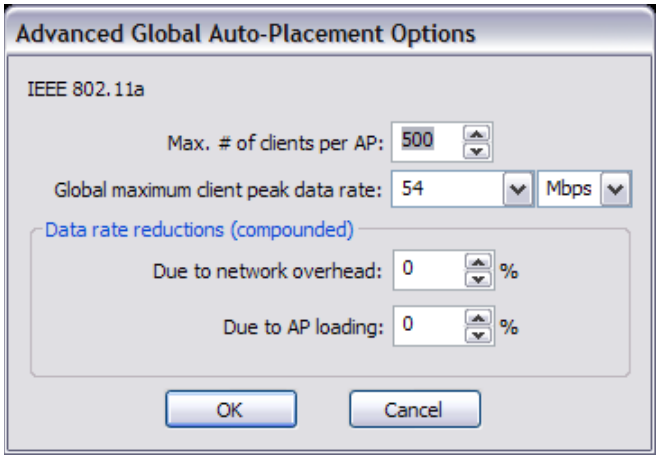


Figure 5.9: Advanced Global Auto-Placement Options

- **Max. # of clients per AP** - This is the maximum number of clients that will connect to each access point.
- **Global maximum client peak data rate** - Each client connecting through the access point will have a upper-limit data rate. Use this setting to specify the peak data rate (applies globally to all clients).
- **Data rate reductions (compounded)** - Use these settings to add data rate “padding” for anticipated network overhead:
  - **Due to network overhead**
  - **Due to AP loading**

Specifying Requirement Regions

Quick Start AP Placement determines access point locations based on requirement regions that you specify and draw in the building model. From within the **Specify Client Location and Requirement Regions** dialog, you can create multiple regions with each region specifying unique coverage, capacity (data rate), and the number of users. The Quick Start algorithm satisfies two different metrics:

- **Coverage** - Guaranteed data rate (peak data rate) across the requirement region, such that each user in that region can connect at that data rate. Data rate is mapped directly from the RSSI (signal strength).
- **Capacity** - Number of users multiplied by average usage per user (called avg. data rate) such that enough access points are placed to satisfy the usage requirements.

If you are working with a drawing that has multiple floors, select the floor from the drop-down box. The Quick Start placement wizard can optimize access point placements for requirement regions defined on multiple floors at once. The requirement region list shows all regions in the drawing, not just for the current floor.

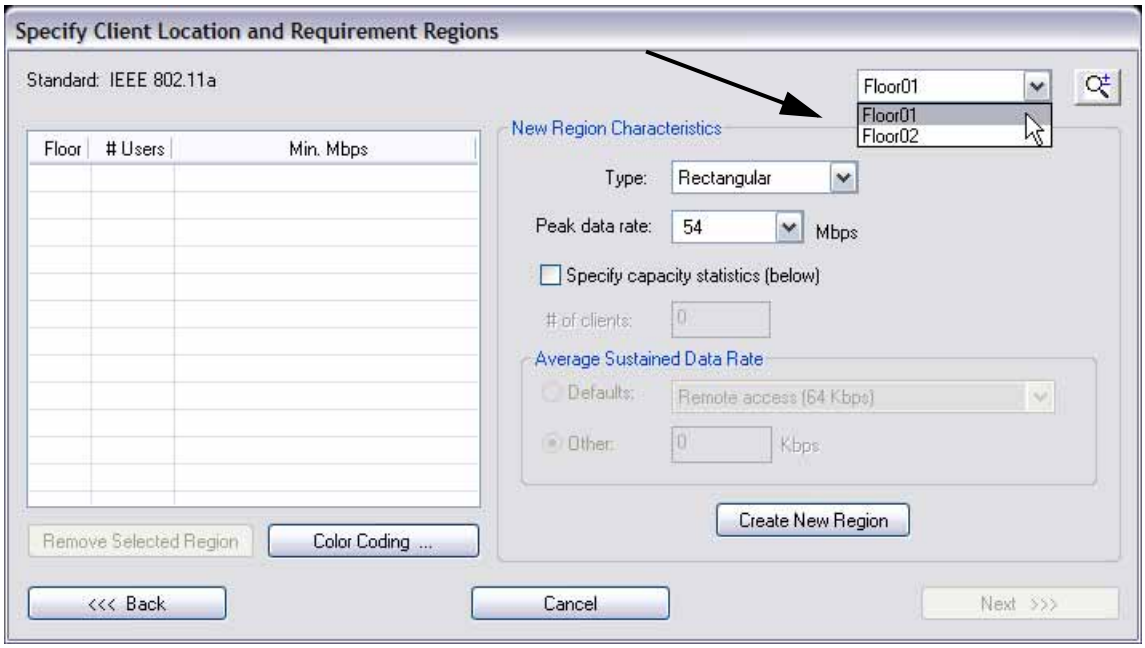


Figure 5.10: Floor drop-down menu

New Region Characteristics

- **Region Type -** This setting determines the shape of new regions. Requirement regions can either be rectangular or circular.

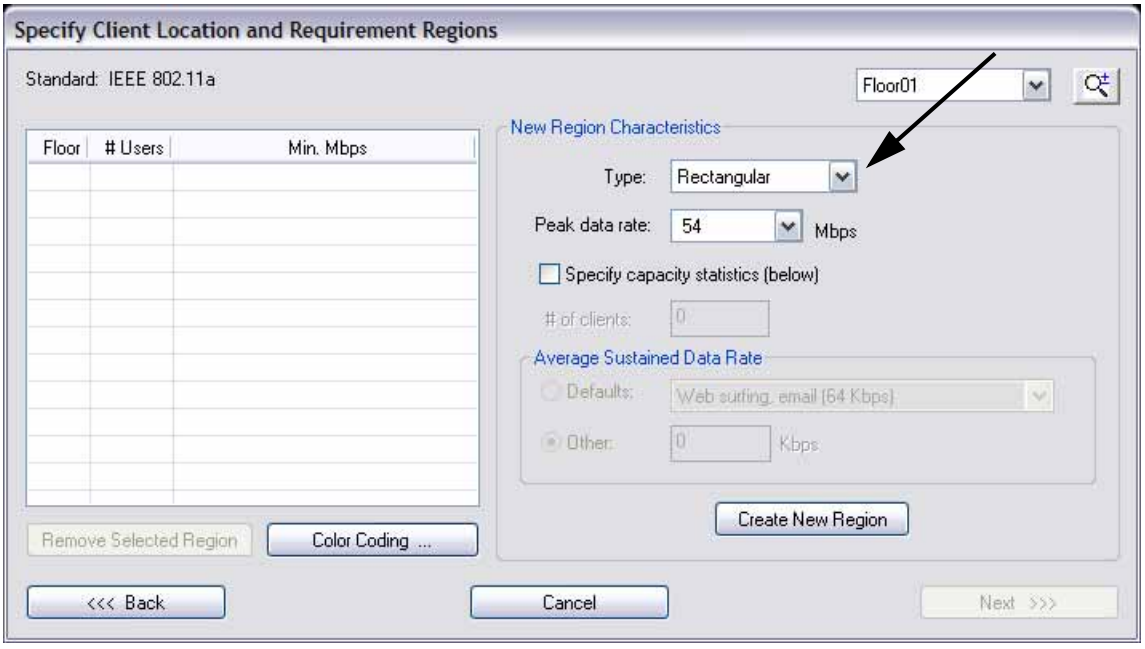


Figure 5.11: New Region Characteristics

- **Peak Data Rate -** This setting specifies the data rate required for all points in newly drawn regions. This setting determines access point placements to ensure sufficient signal coverage.

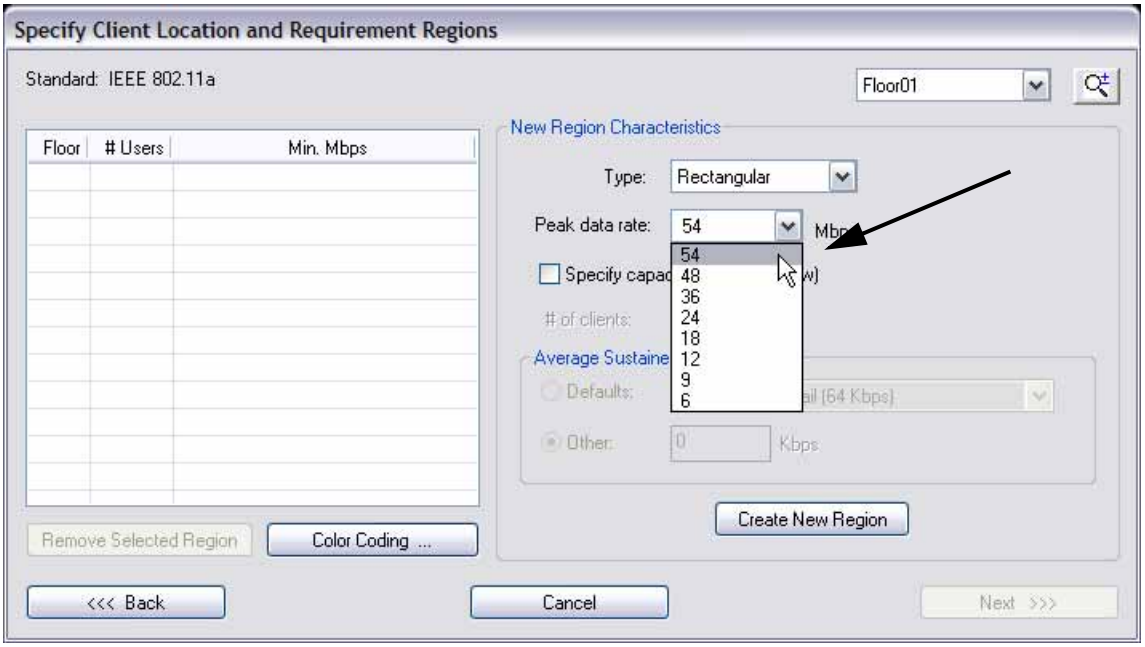


Figure 5.12: Specifying peak data rate

- **Specify capacity statistics-** Check this box to enable the **# of clients** and **Average Sustained Data Rate** fields, which direct LANPlanner Solo to consider capacity during access point placement. Leaving the box unchecked directs LANPlanner Solo to place access points based on coverage only.

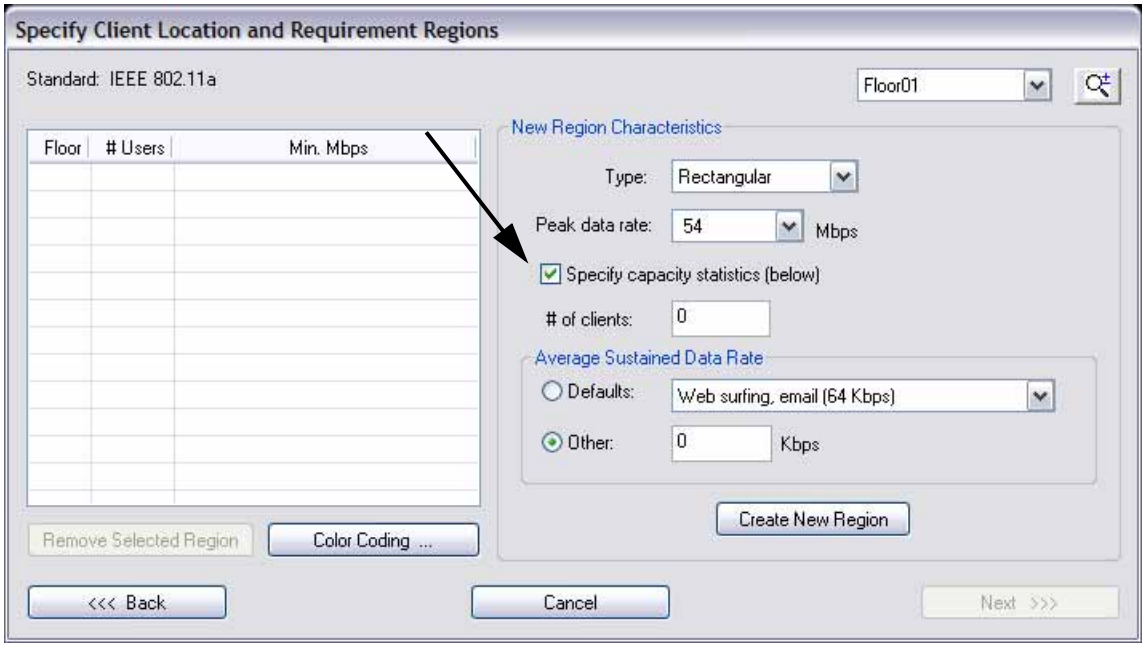


Figure 5.13: Specifying Capacity

- **# of Clients -** The number of clients (wireless network users) is also a factor in determining capacity. Enter the number of users that you expect to be located in this region of your wireless network. LANPlanner Solo takes the number of users into account when placing and predicting access point performance.

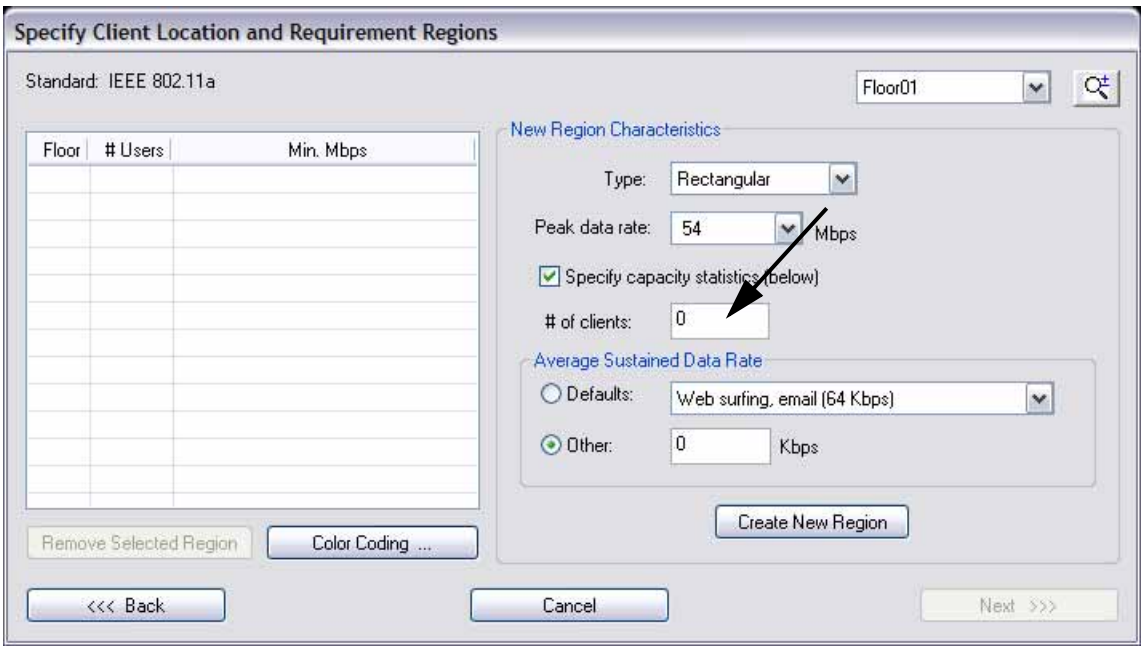


Figure 5.14: Selecting Number of Clients

- **Average Sustained Data Rate: Defaults -** Select user application bandwidth requirements from a drop-down menu. **Web surfing, email (64Kps)** activities are considered a light load for the wireless network. If you have high bandwidth requirements such as file transfers, video, etc., select the average data rate that your user applications will require. LANPlanner Solo takes data rate into account when placing and predicting access point performance.

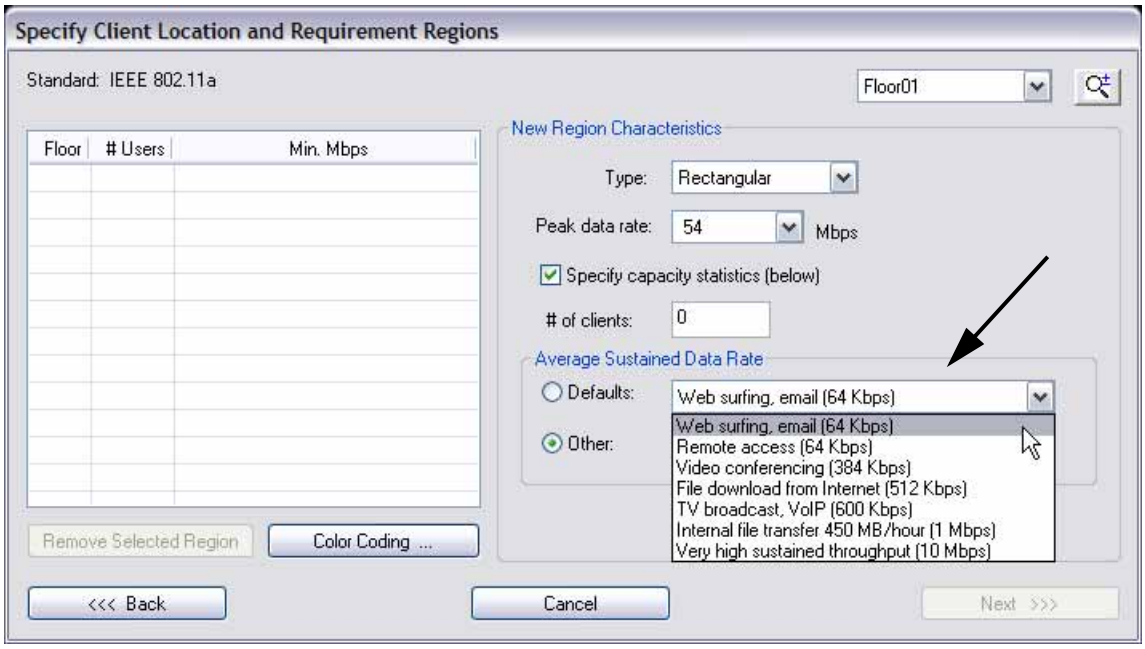


Figure 5.15: Selecting Average Sustained Data Rate

- **Average Sustained Data Rate: Other -** Use this field to specify the data rate in Kbps, if you require a custom Average Sustained Data Rate not available in the Defaults pull-down menu.

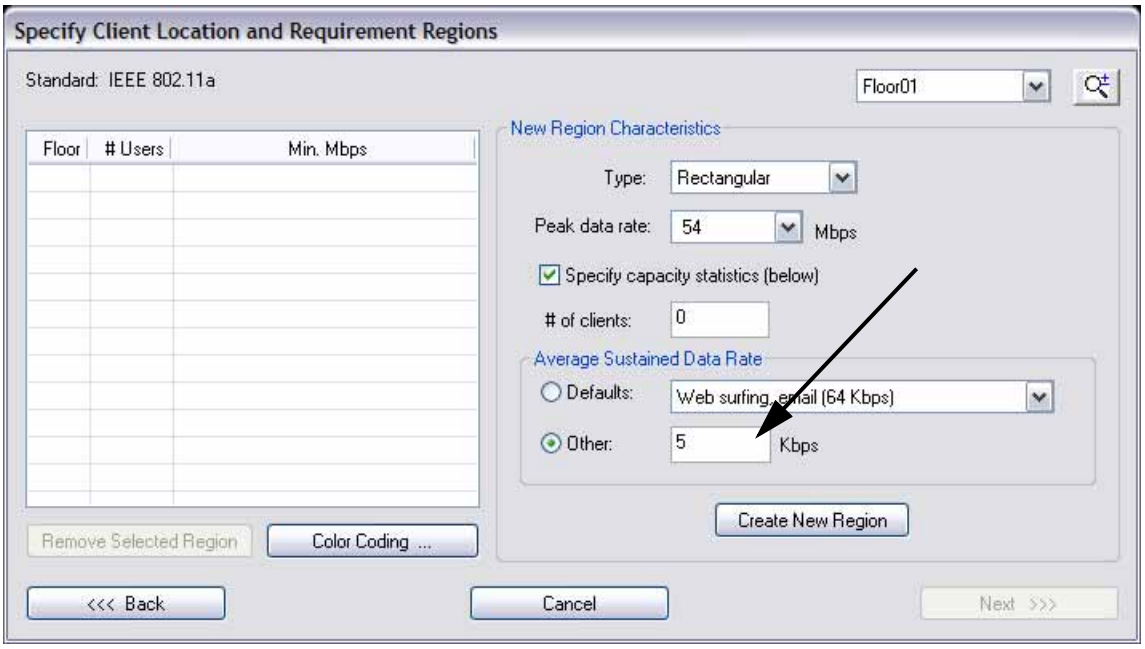


Figure 5.16: Entering “Other” Data Rate

After entering the New Region Characteristics, create the new region in the building drawing by selecting **Create New Region**. Left-click once to begin the region and again to specify the end point. Overlapping regions can be drawn to completely specify an area. It is best to draw regions slightly inside partitions that serve as a region’s boundary. The example below shows the new region:

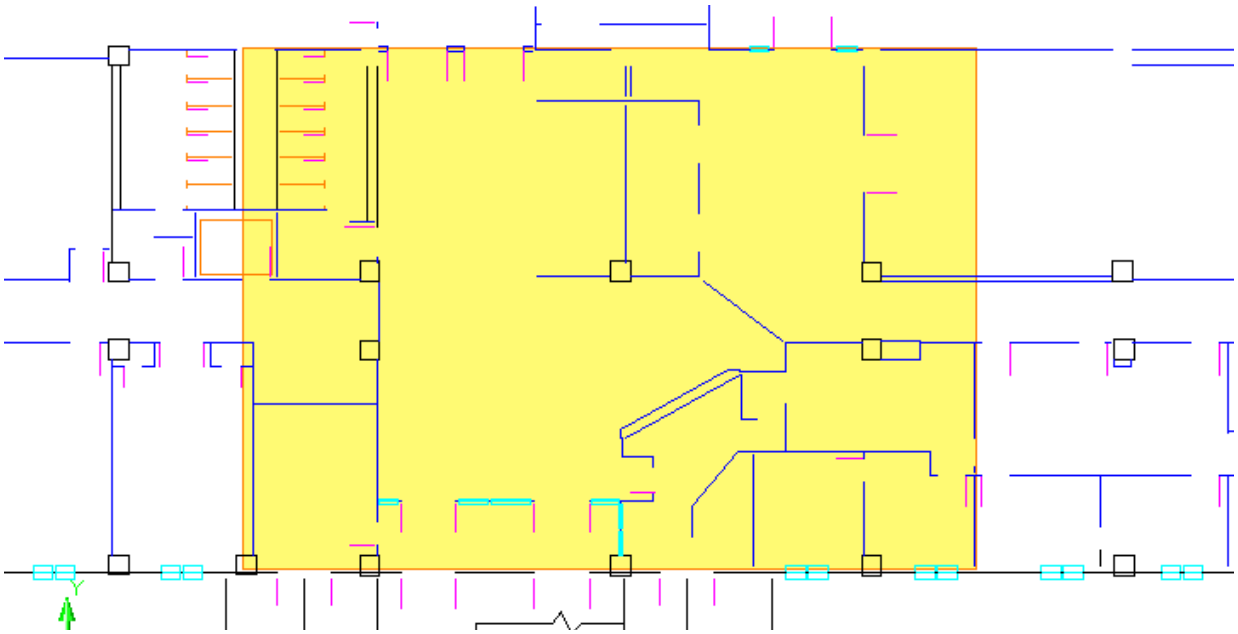


Figure 5.17: New Region (rectangular)

Once you are finished drawing the new region, the **Specify Client Location and Requirement Regions** updates with the new requirements region. Optionally, you can change the requirement region colors by selecting **Color Coding** (see “Color Coding” on page 118). Otherwise, click **Next**.

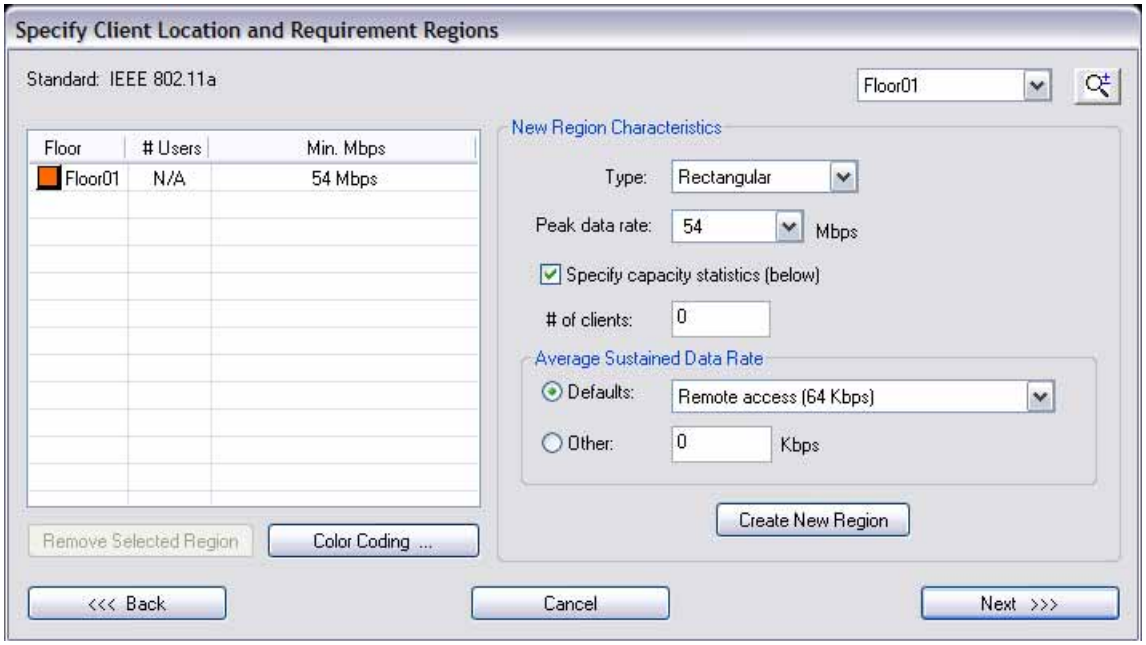


Figure 5.18: New requirements region

To remove an existing requirements region, select the region in the list and click **Remove Selected Region**. The list and drawing display updates to reflect the removed region.

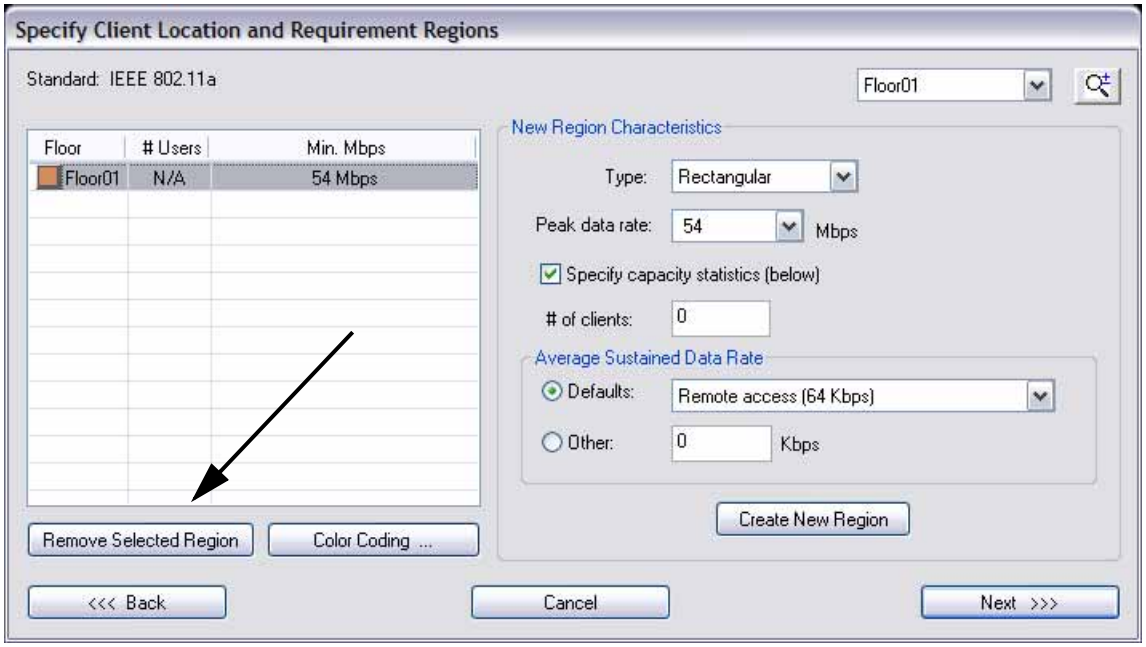


Figure 5.19: Removing a requirements region

General Options

In addition to configuring and placing new requirement regions, Quick Start AP Placement includes some tools to view and change existing regions.

Select **Color Coding** to specify the color scheme used for regions drawn in the design. Region colors are assigned according the data rate as defined in the color scheme editor. Changing these settings updates the drawing and the region list in the requirement region window on the fly.

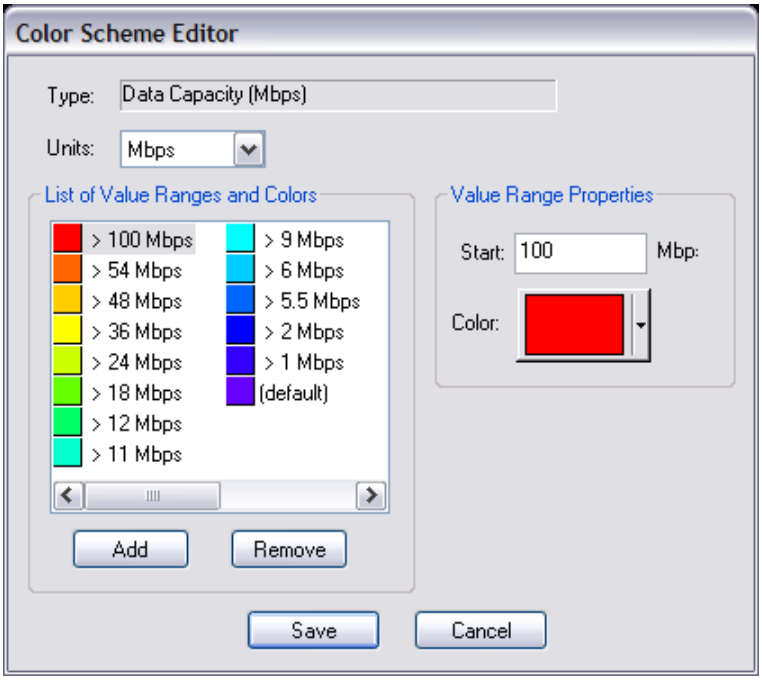


Figure 5.20: Color Coding

Specifying Exclusion Regions

Sometimes the designer may need to identify areas in a building that equipment cannot be placed in. These areas, know as exclusion regions, can be specified so that LANPlanner Solo will not place any access points within them. Exclusion regions override requirement regions such that requirement regions may not be completely satisfied if exclusion regions prevent access points from being placed to satisfy them. The equipment exclusion region window is shown below:

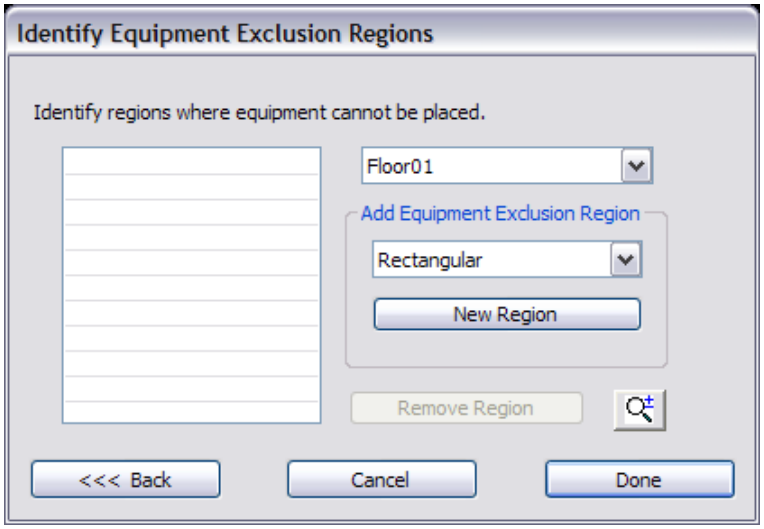


Figure 5.21: Identify Equipment Exclusion Regions dialog

To specify an exclusion region, click **New Region** on the equipment exclusion regions window. Left-click once to begin the region and again to specify the end point. Overlapping regions can be drawn to completely specify an area. The example below shows the new exclusion region

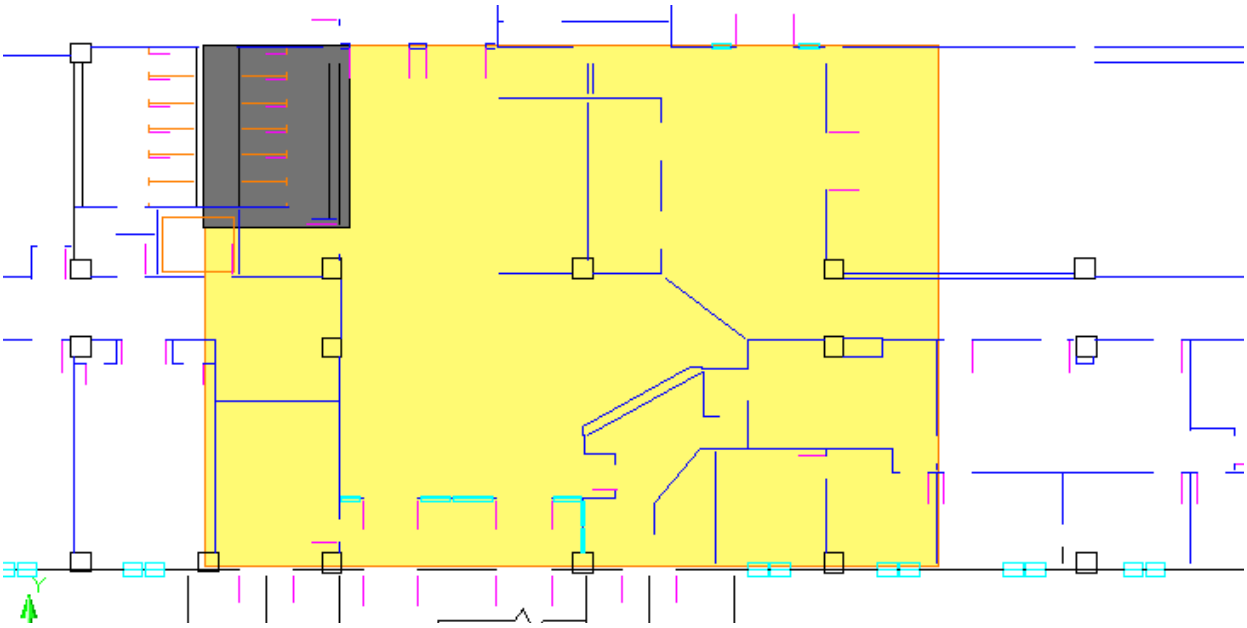


Figure 5.22: Exclusion Region (gray) within AP placement region

To execute Quick Start AP Placement with your settings, select the **Done** button from the Identify Equipment Exclusion Regions dialog. LANPlanner Solo's placement engine then:

- Chooses optimal locations for the access points to satisfy coverage and capacity requirements
- Determines optimal channel assignments to maximize SIR (Signal-to-Interference Ratio), and sets the channel on each access point appropriately
- Optimizes and configures power levels, effectively reducing the power of access points from the initial power setting
- Takes floor-to-floor signal into consideration and also takes into account access points which already exist in the current drawing

After executing Quick Start AP Placement, LANPlanner Solo updates the drawing window with the placed access points and signal coverage contour:

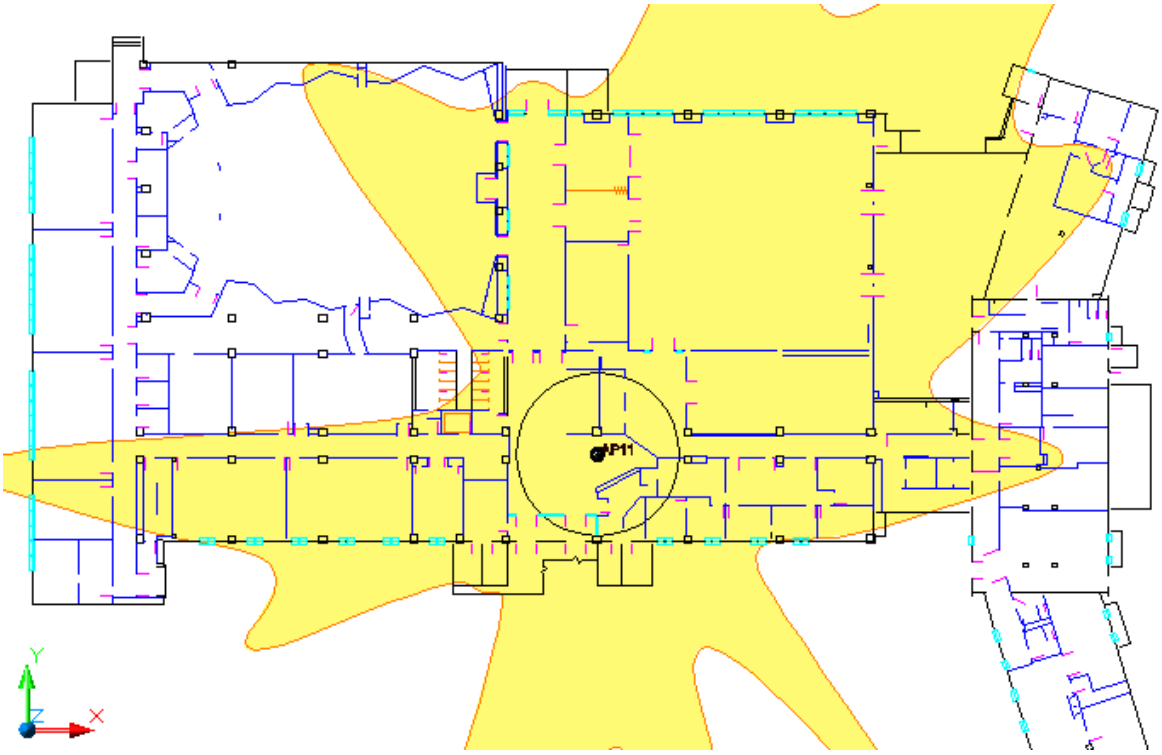


Figure 5.23: Quick Start placed AP with coverage contour

Once you are satisfied with access point placement, you are ready to evaluate the design in detail and reconfigure hardware as needed.

Edit/Remove Access Point

The **Network Design > Edit/Remove Access Point** command allows you to edit, remove, move, or copy any access point in the drawing. Selecting Edit/Remove Access Point opens the dialog shown in Figure 5.25.

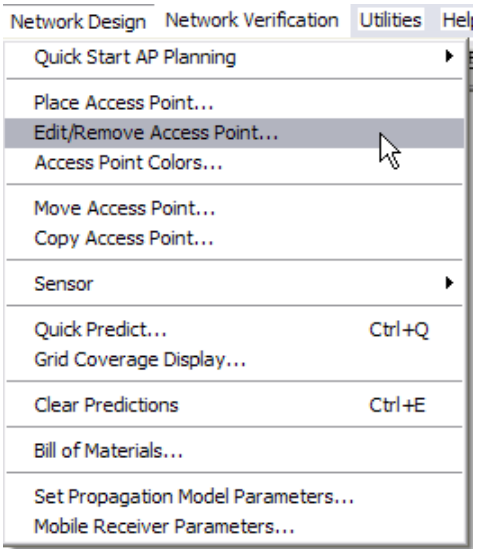


Figure 5.24: Edit/Remove Access Point selection

The Edit/Remove Access Point dialog shows a list of every access point in the drawing, a description of the Access point, its floor location, air interface standard, channel number, and transmit power. You may click in the **Name** or **Description** field to directly edit that field, or you may optionally double click on the access point icon next to the access point name to bring up an edit window with more options.

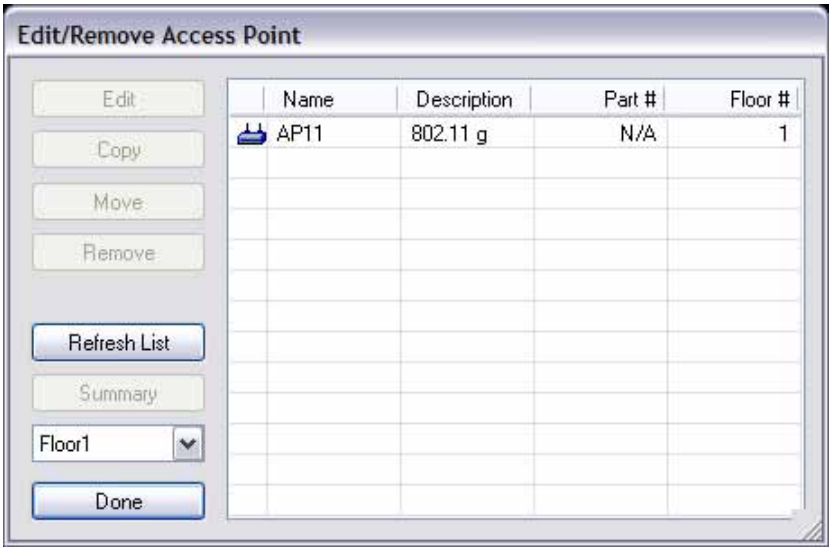


Figure 5.25: Edit/Remove Access Point dialog

The following options are available from the Edit/Remove Access Point dialog:

- **Edit —** This button allows you to edit an individual access point's name, power settings, style, and position. See "Edit" on page 122.
- **Copy —** To copy an access point, select it from the list and press the Copy button. You may then click on the drawing to place a copy of the access point the same way you use the Place Access Point command. Press the **ESC** key to return to the Edit/Remove Access Point dialog. You may copy an access point to another floor in the drawing by first switching to that floor.
- **Move —** The Move Access Point button works the same way as the Copy Access Point button, except that the access point will be moved from its previous location to the new point in the drawing where you click.
- **Remove —** To remove an access point or access points, select them from the list and then press the **Remove** button. Use caution when removing an access point, as removing an access point can not be undone
- **Change Floors —** The Edit/Remove Access Point dialog box provides a floor pull down list that allows you to change your view to a different floor of the drawing. Use this combo box to see the location of access points on other floors.

Edit

Choosing the Edit button on the Edit/Remove Access Point dialog in Figure 5.25 opens the Edit Access Point dialog below:

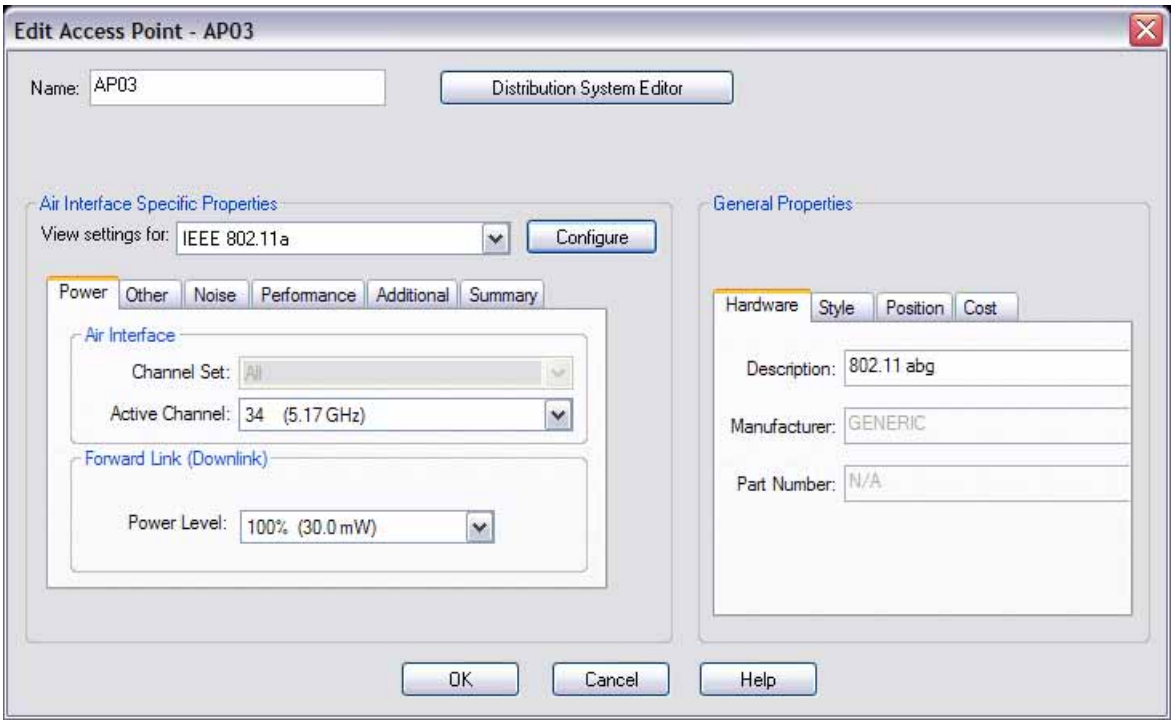


Figure 5.26: Edit Access Point dialog

Within a local project workspace, all access points must have a unique name. That is, the name entered in the Name edit box cannot be used for any other access point within the drawing. If you accidentally enter a duplicate name in the edit box, LANPlanner Solo will display a warning message. The access point name may be up to 20 characters long, but can only consist of alphanumeric characters. New access points are automatically given a

name in the form of APXX, where XX is an auto-incremented number incremented each time a new access point is added. Naming restarts at 01 for each new project workspace.

- **View settings for** - This drop-down menu controls which air interface standard you are modifying settings for, such as independently setting different power levels for 802.11a and 802.11g.
- **Configure** - This dialog allows you to manually set Air Interface Standards beyond the default access point settings. With this capability, you can remove intermediate channel frequencies as an added precaution to minimize channel overlap interferrence.

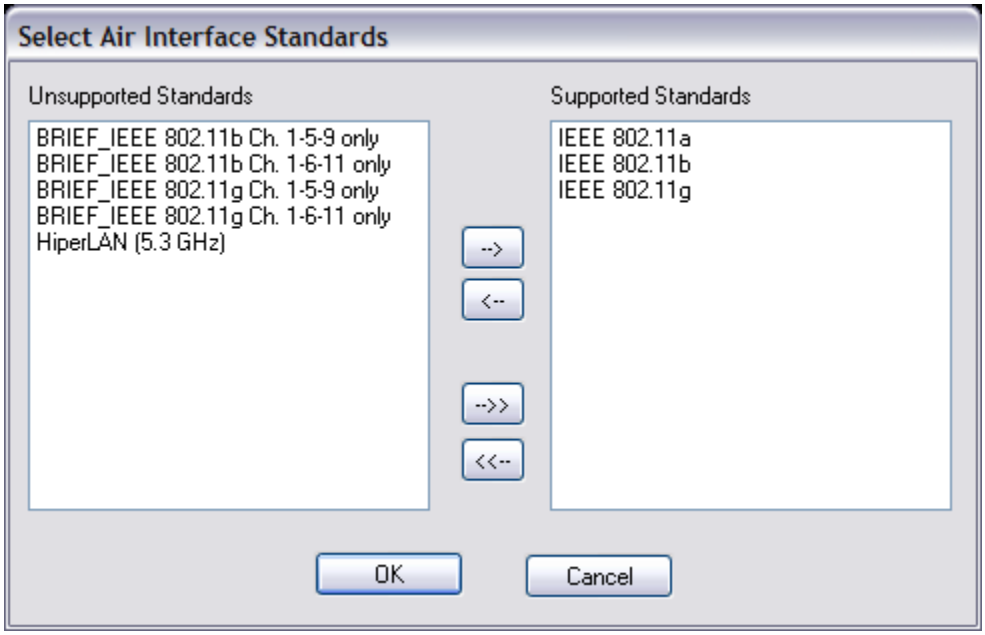


Figure 5.27: Edit Access Point - Configure dialog

- **Access Point Power Tab** - The Power tab allows for the configuration of the transmit power and frequency of an access point. Selecting the Standard pull-down list presents a list of wireless communication standards that have been defined for the access point. You can configure the channel settings and power level on a per standard basis. To do so, first select the standard you wish to edit from the Standard pull-down list. Next, select the Air Interface Channel Set, Active Channel, and Power Level from the other pull-down lists on the Power tab.

  The **Active Channel** drop-down menu allows you to select the channel for the current air interface standard:

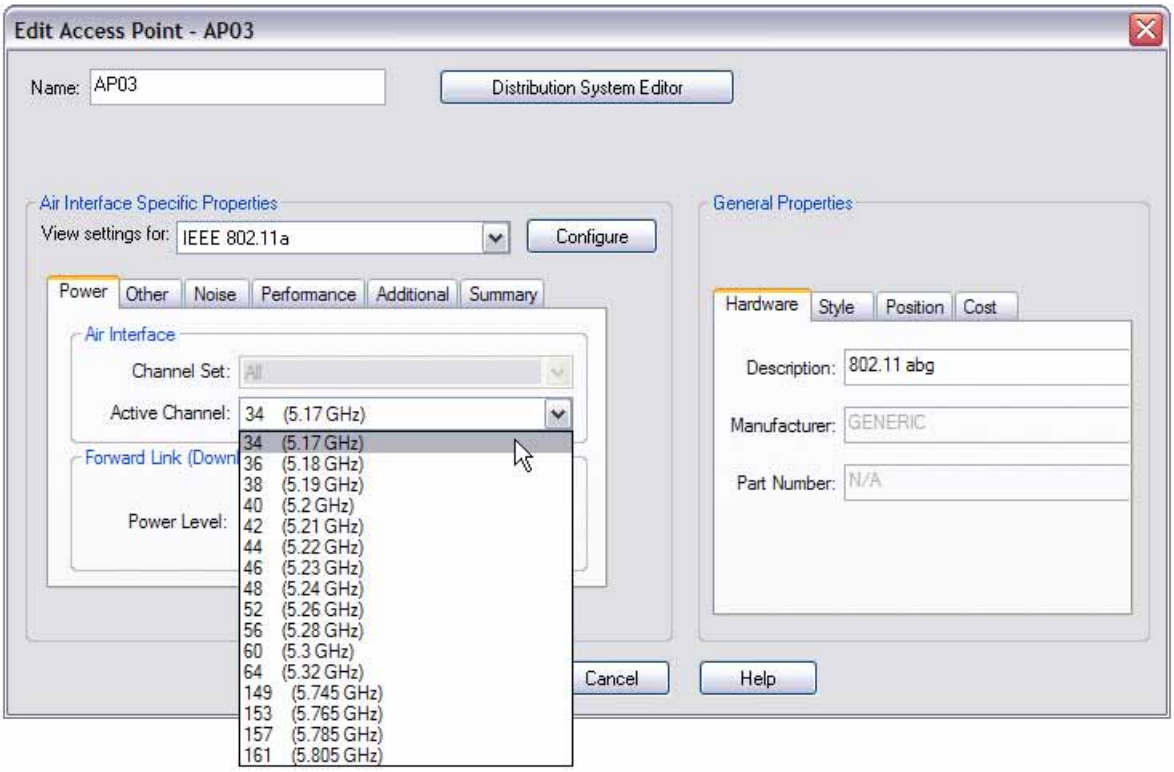


Figure 5.28: Edit Access Point - Active Channel Frequencies

The **Power Level** drop-down menu allows you to select the transmit power for the current air interface standard for the access point:

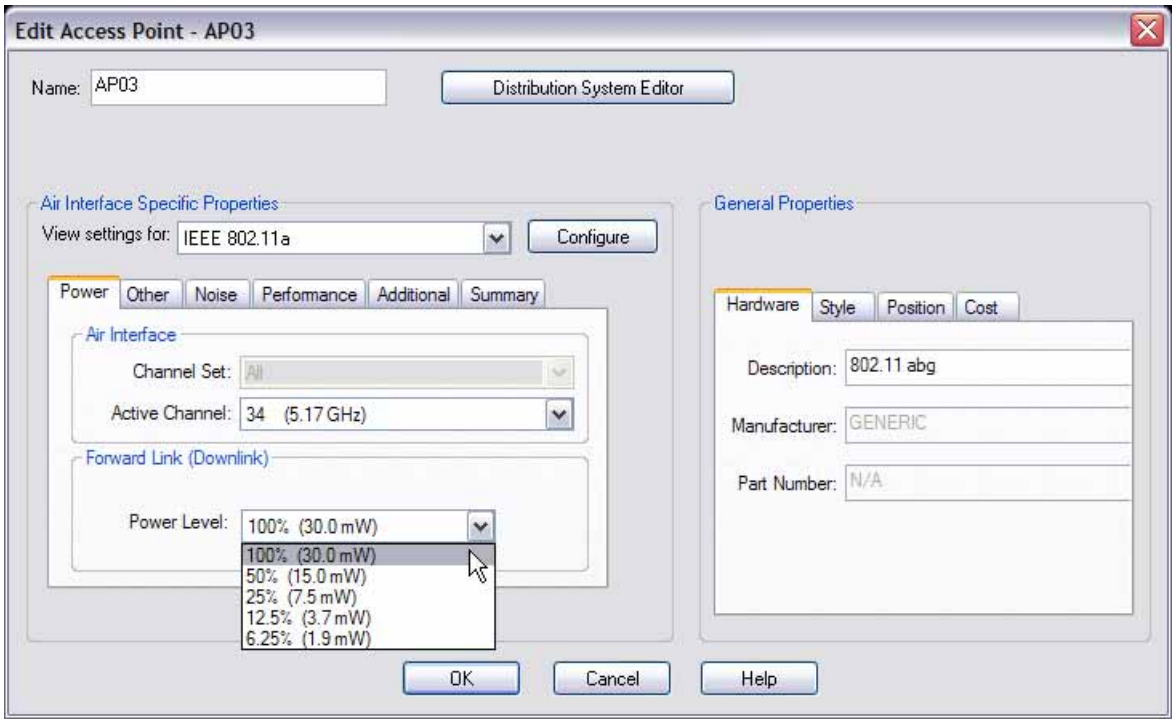


Figure 5.29: Edit Access Point - Power Levels

- **Access Point Additional Tab -** You can optionally assign the 32-character SSID (Service Set Identifier) and the MAC (Media Access Control address) for the current access point. Each air interface standard can have its own SSID and MAC address, which are set for the air interface standard currently selected in the **View settings** for drop-down menu.

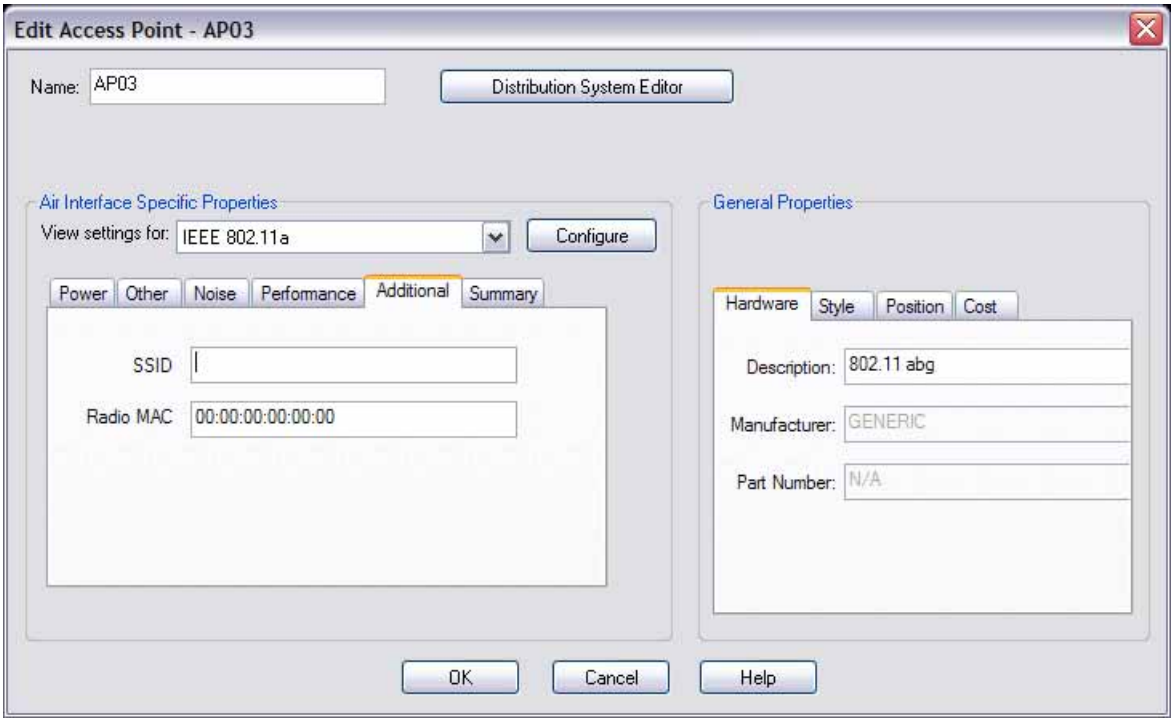


Figure 5.30: Edit Access Point - Additional settings

- **Access Point Summary Tab -** Provides a the configuration parameters for the selected access point:

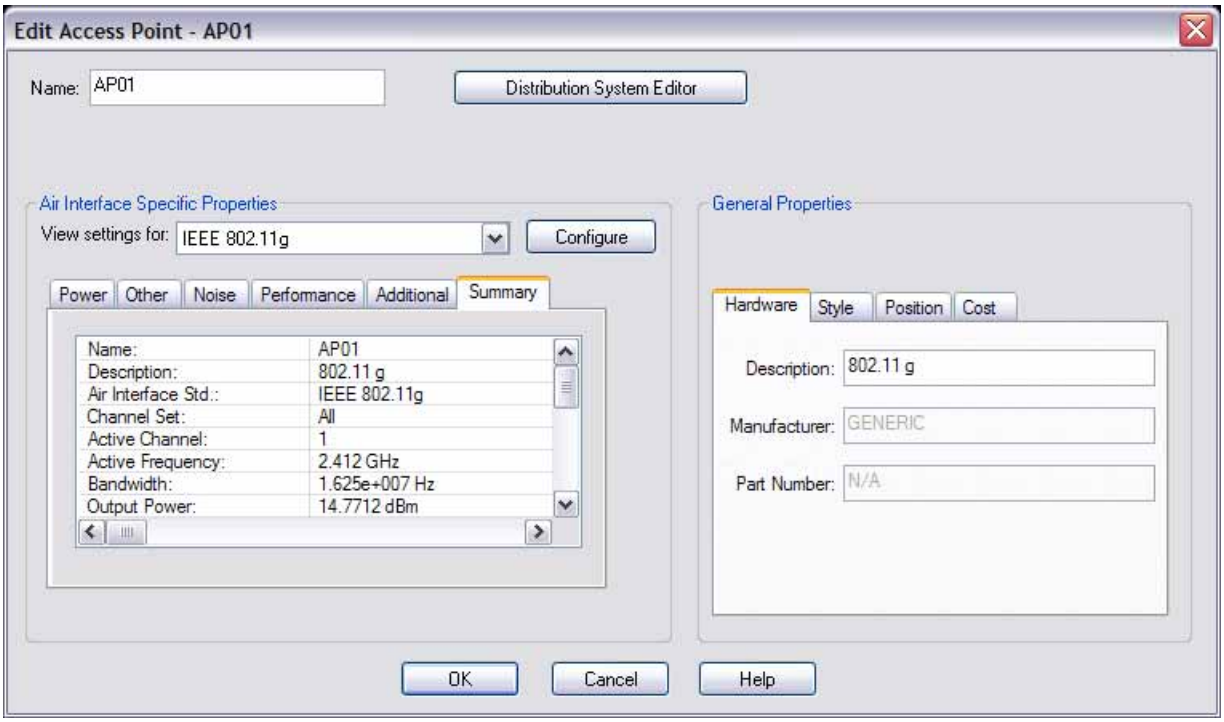


Figure 5.31: Edit Access Point - Summary

- **Access Point Hardware Tab** - The Access Point Hardware tab enables you to specify a description of the selected access point. This is only for your reference in distinguishing the transmitter from other transmitters. The access point description may be up to 128 characters:

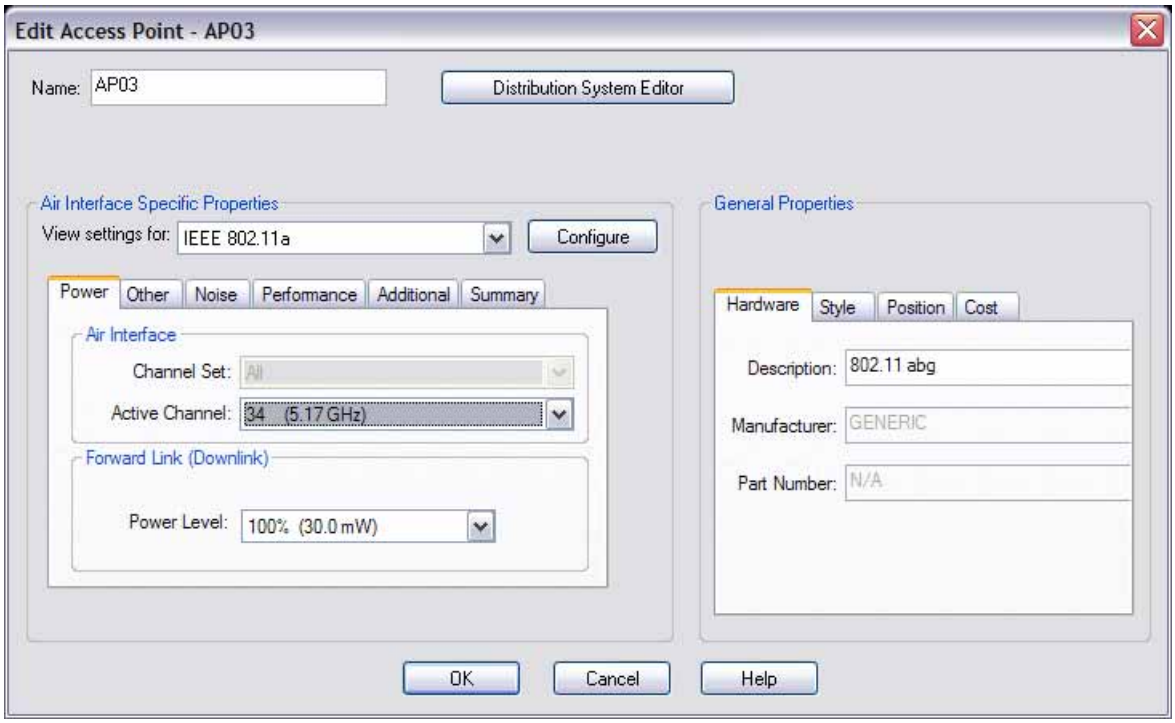


Figure 5.32: Edit Access Point - Hardware

- **Access Point Style Tab** - The Access Point Style tab enables you to specify the color, display settings, and size of the marker used to identify the location of the access point on the drawing. The Display Antenna System drop down list lets you turn on or off the display of the antenna system attached to the access point, or show only the components of the antenna system placed on the current floor. By default, all components of the antenna system are shown.

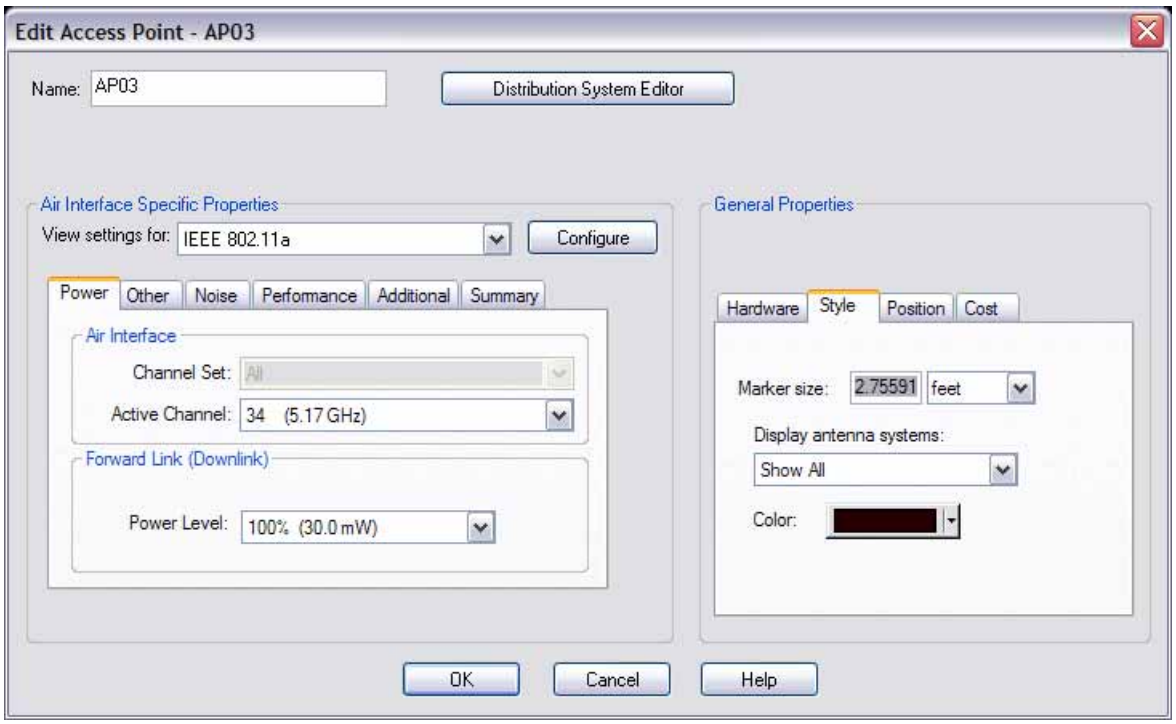


Figure 5.33: Edit Access Point - Style

- **Access Point Position Tab** - The Access Point Position section configures the location of the access point. This enables you to enter the absolute position of the access point on the floor within the building. All coordinates are given relative to the origin (also called the Floor Alignment Point) of the building coordinate system.

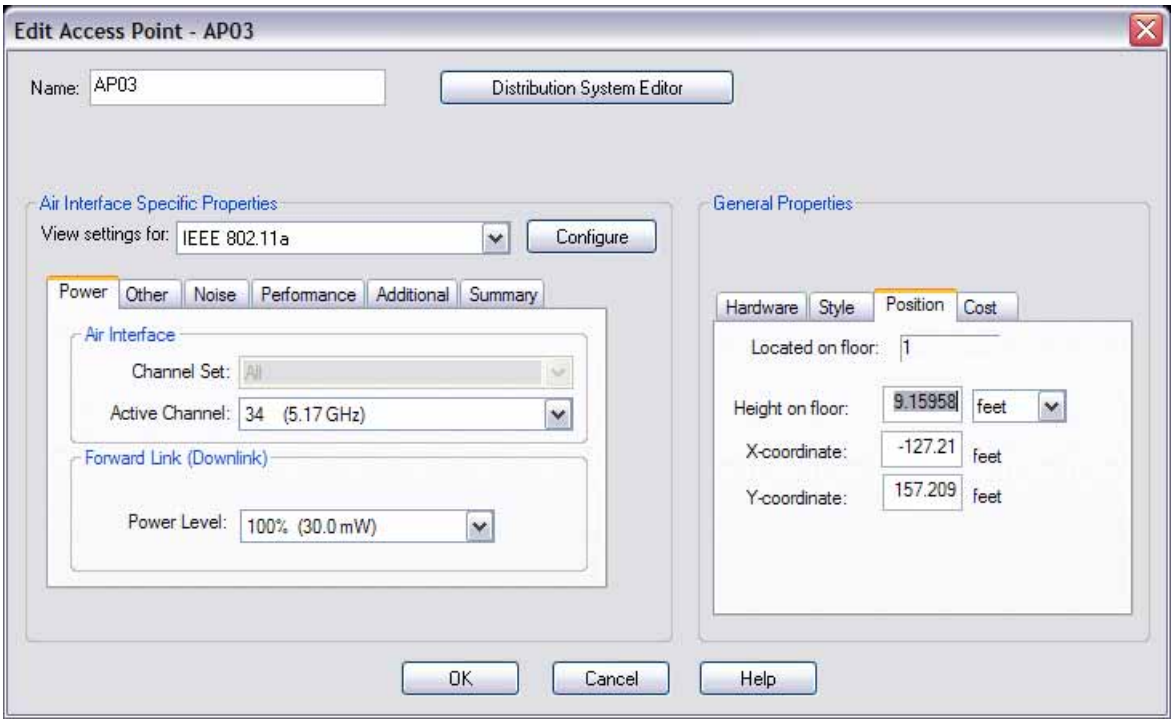


Figure 5.34: Edit Access Point - Position

- **Access Point Cost Tab** - Entering the Unit Cost and the Installation Cost for unique access point types allows this information to be calculated when you generate the final Bill of Materials (see “Generating a Bill of Materials” on page 182).

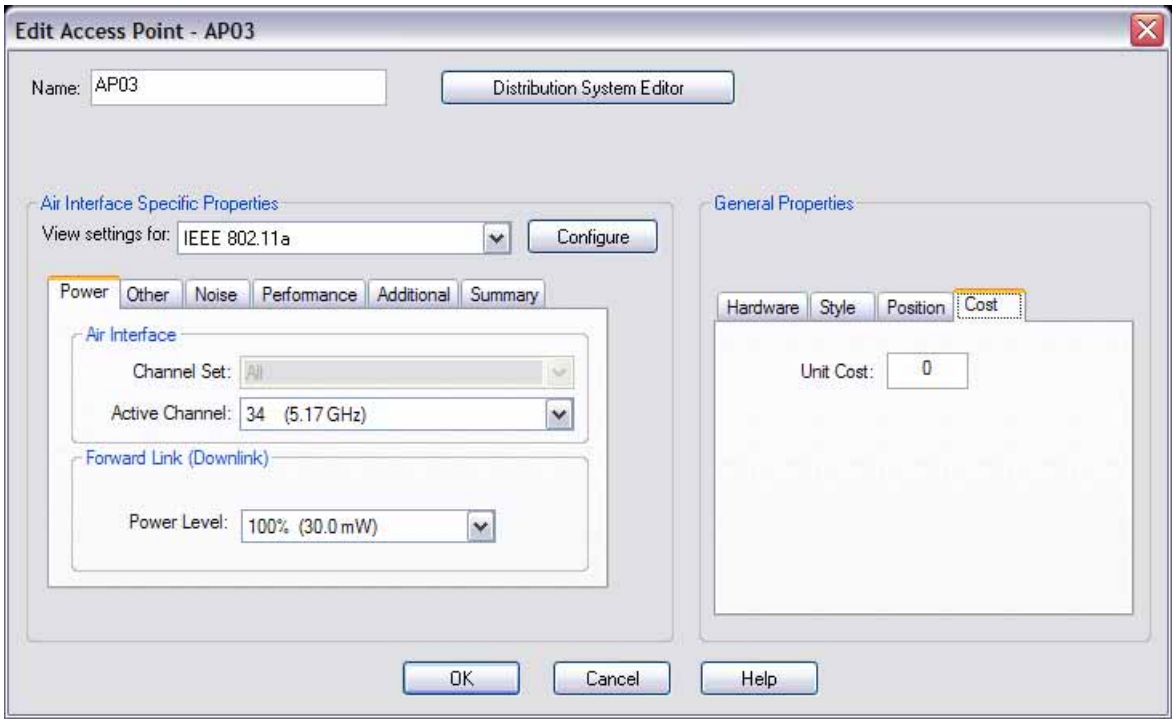


Figure 5.35: Edit Access Point - Cost

Distribution System Editor

Selecting **Distribution System Editor** from the **Edit Access Point** dialog opens the Distributed Antenna System dialog. A distribution system is the path through which the RF signal travels before being transmitted into the air, and includes the connectivity medium of your network such as antennas, cables and their routes, and repeater amplifiers. Use the features in the Distribution Antenna System dialog to manage the distribution system components in your wireless network design. Most users will leverage this functionality to swap antennas of access points.

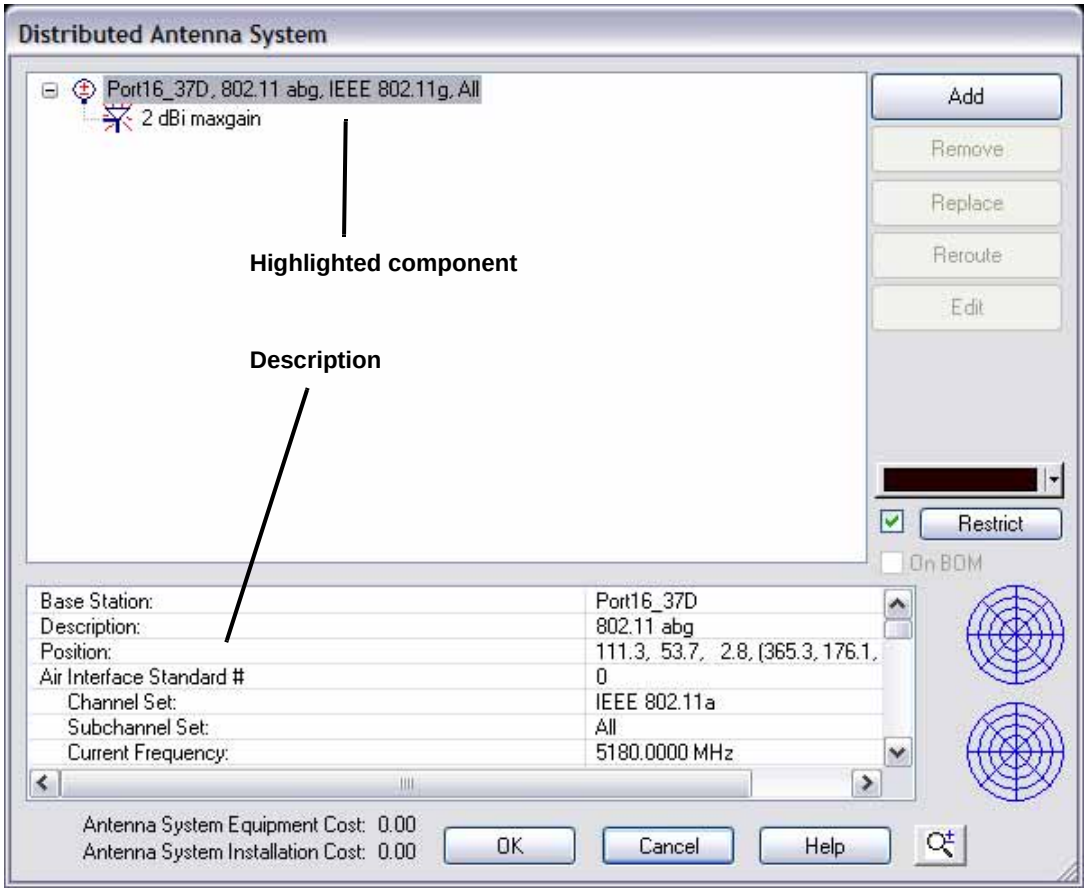


Figure 5.36: Distributed Antenna System dialog

Editing a RF Distribution System

There are several ways to define the RF distribution system or antenna system for a given transmitter. When you create a new access point, you can click the Distribution System Editor button after placing the access point. To modify existing antenna systems, edit the access point and then click the Distribution System Editor button. Highlighting a component updates the Component Information box

Adding Distribution System Components

The process of adding a component to a distribution system varies depending on the component selected, but the basic concept remains the same. **In order to add a component into the distribution system, there must be a component already in the system with an available connection**, such as the access point itself, or a cable with an available output connector. The open connection will be displayed in the distribution system tree as a connector and will be labeled OPEN. Connections which have been used to connect to another component are replaced in the display by the other component and thus only open connectors are displayed.

To add components to a distribution system, select an open connector in the transmitter system or on the access point itself, then click the **Add** button. This displays the **Component to Add** dialog box. You may now select the general type of component you want to add to the antenna system. You can also add components by right-clicking on the access point or on an open connector and then selecting Add from the resulting pop-up menu.

- **Adding an Antenna** - Access Points are pre-configured with a default antenna. To add a specific antenna to an access point, you must either replace the existing antenna or remove it prior to placing a new one. To add an antenna, select an open connector or the access point itself and click **Add**. From the **Component to Add** dialog select **Antenna**, then click **Next** to open the **Select Component from Database to Add** dialog. Alternatively, you can also right-click on an existing component and choose insert to put the component above the selected component in the system.

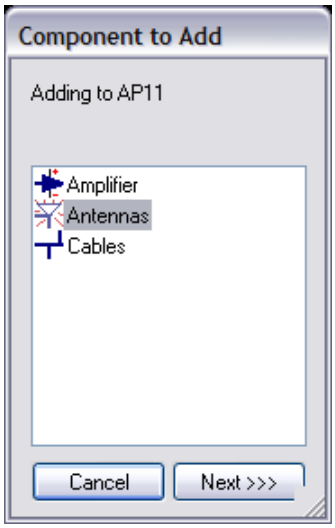


Figure 5.37: Component to Add - Antennas

Select the antenna model from the list and then click **OK**:

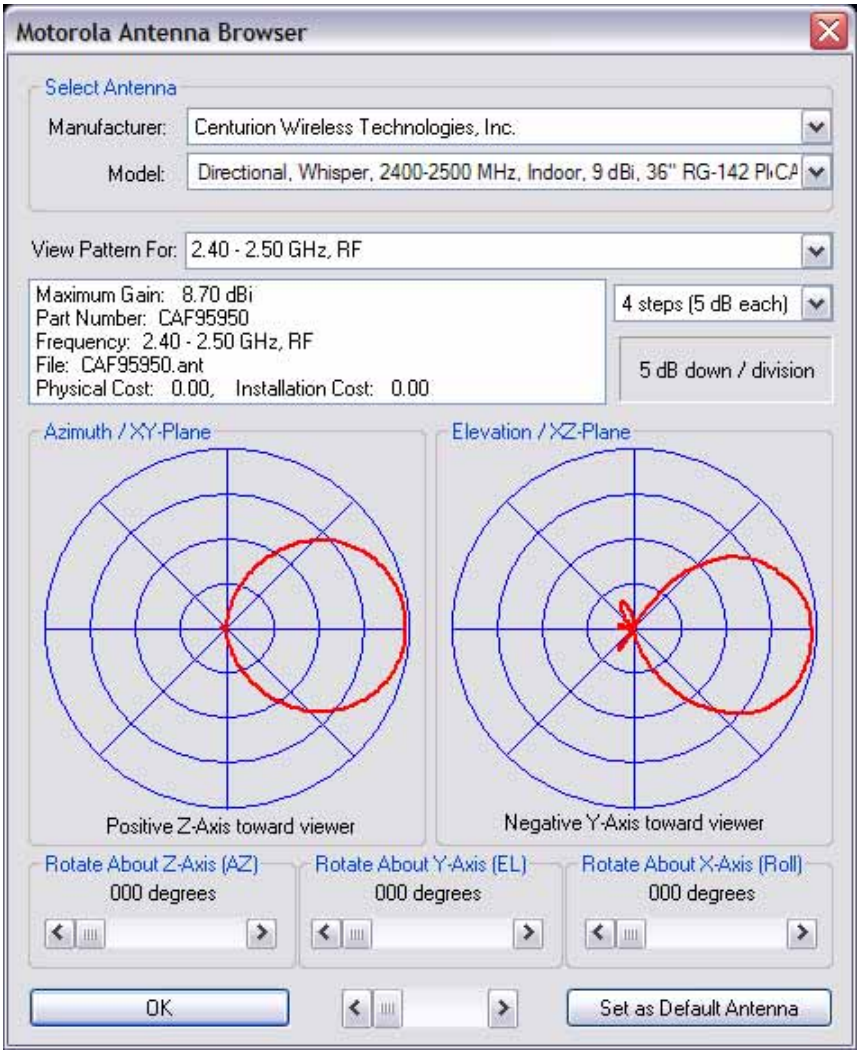


Figure 5.38: Antenna Browser

The new antenna is added to the Distributed Antenna System list:

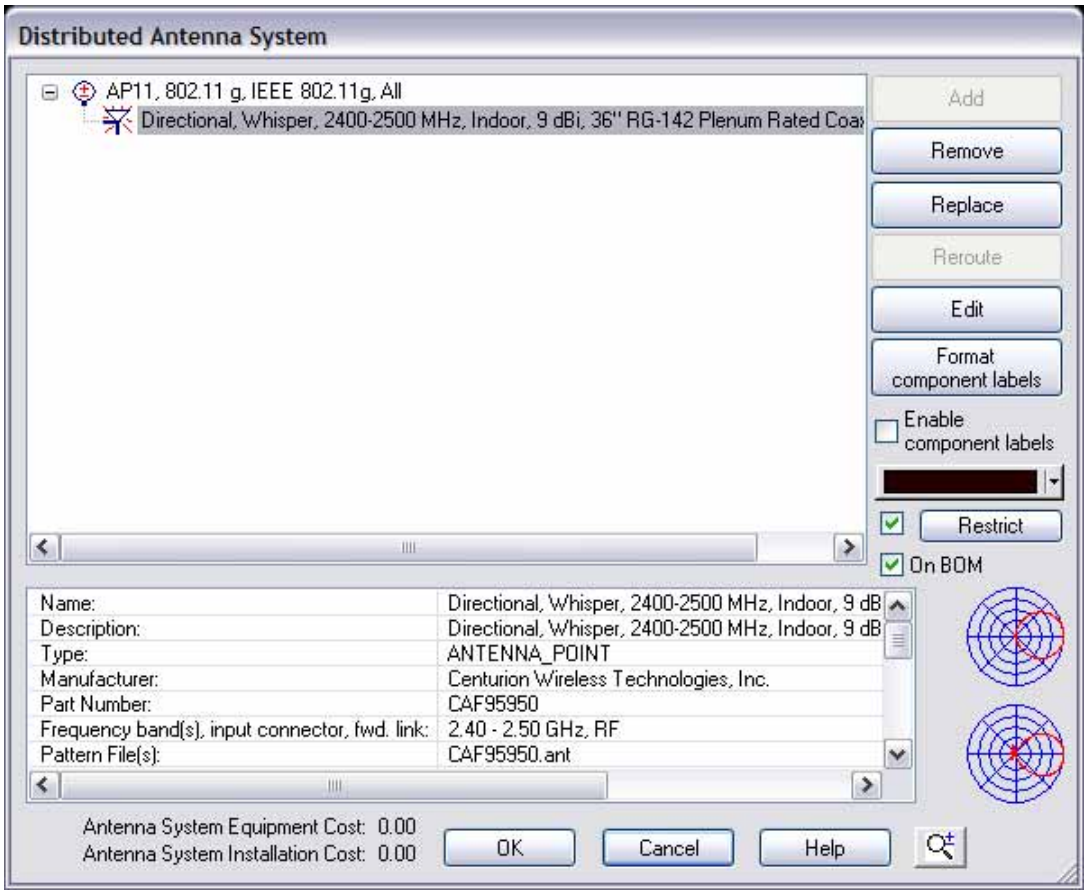


Figure 5.39: Antenna added to system list

Manipulating Components in the Distributed Antenna System Dialog

The appearance and position of components in the antenna component system can be changed in a number of ways. You can use the buttons along the right side of the antenna system editor dialog box to perform these functions or you can right-click on components in the design.

- **Removing Components** - To remove an antenna system component, simply highlight it in the dialog box and select the **Remove** button. You can also right-click on the component to access a pop-up menu and choose Remove. Removing a component involves removing all the parts connected to it in the direction away from the access point. This is done automatically. For example, if you remove the cable connecting an antenna to the access point, the cable and the antenna will be removed, but not the access point.
- **Replacing Component** - To replace a component with a different part, select the component to replace in the dialog box and click the **Replace** button. The resulting dialog box has a sortable list of components. Highlight the desired part and click OK. You can also activate this command by right-clicking on a component and choosing Replace from the resulting pop-up menu. The Replace command enables you to quickly analyze trade-offs involving changes in system performance based on antenna selection, for example

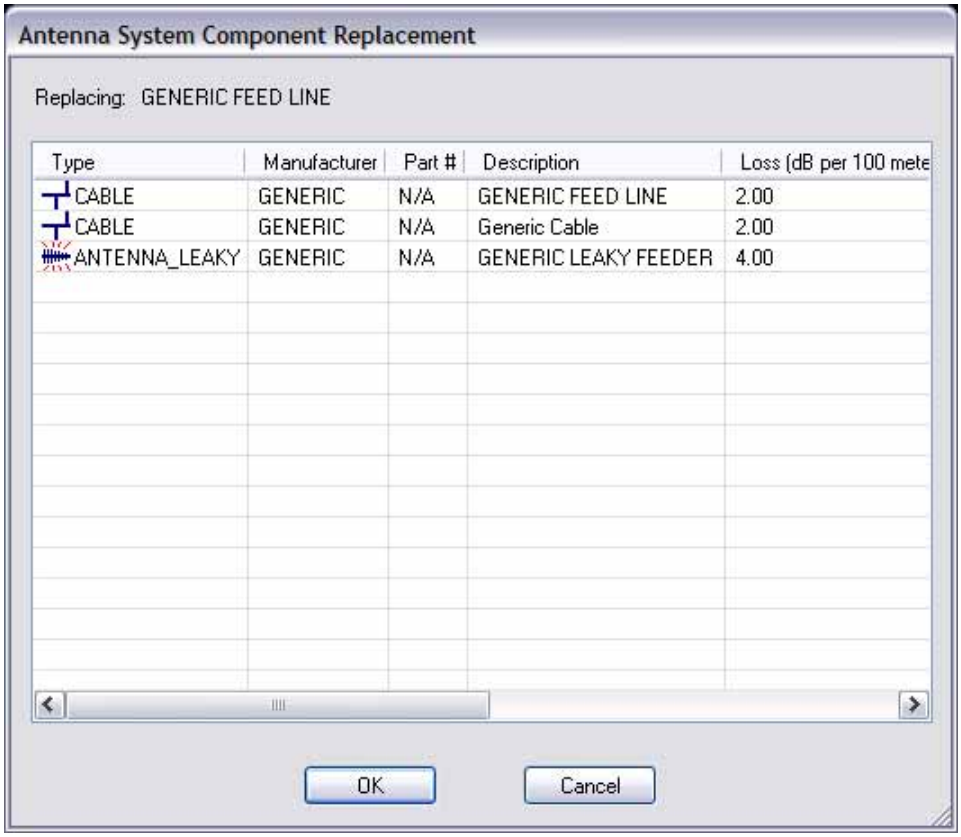


Figure 5.40: Replacing components

- **Rerouting Cables** - Cables can be re-routed via the Reroute button in the antenna system editor. Simply select the cable, click the **Reroute** button and trace out the new route for the cable. Any components attached to the end of the cable will be moved to reflect the new ending position.
- **Component Colors** - The color of an individual component can be changed by using the color swatch drop-down menu in the antenna system editor. Each component will be displayed with the same color as the access point.

Figure 5.41: Selecting a component color

- **Antenna Orientation** - To change the orientation of an antenna or to view a larger version of the pattern, select the antenna and click the **Edit** button. This opens the **Edit Antenna** dialog, which contains slider controls for rotating the antenna:

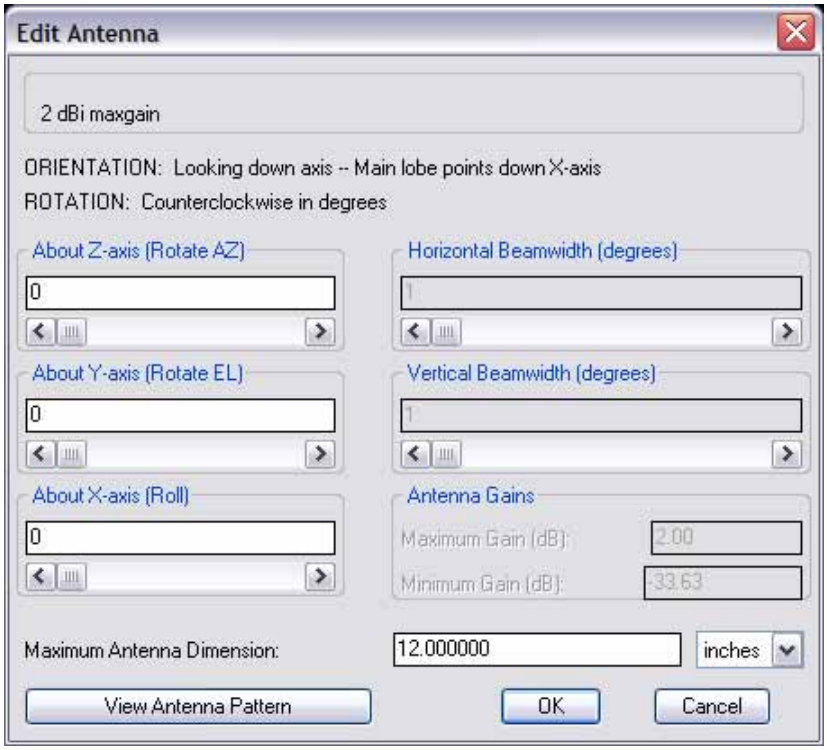


Figure 5.42: Edit Antenna dialog

You can also see the actual RF radiation pattern by selecting the **View Antenna Pattern** button, which opens the Antenna Pattern dialog. From this dialog you can also change the Frequency Range (IEEE 802.11a/IEEE 802.11.g) and change the number of grid steps in the displayed antenna pattern.

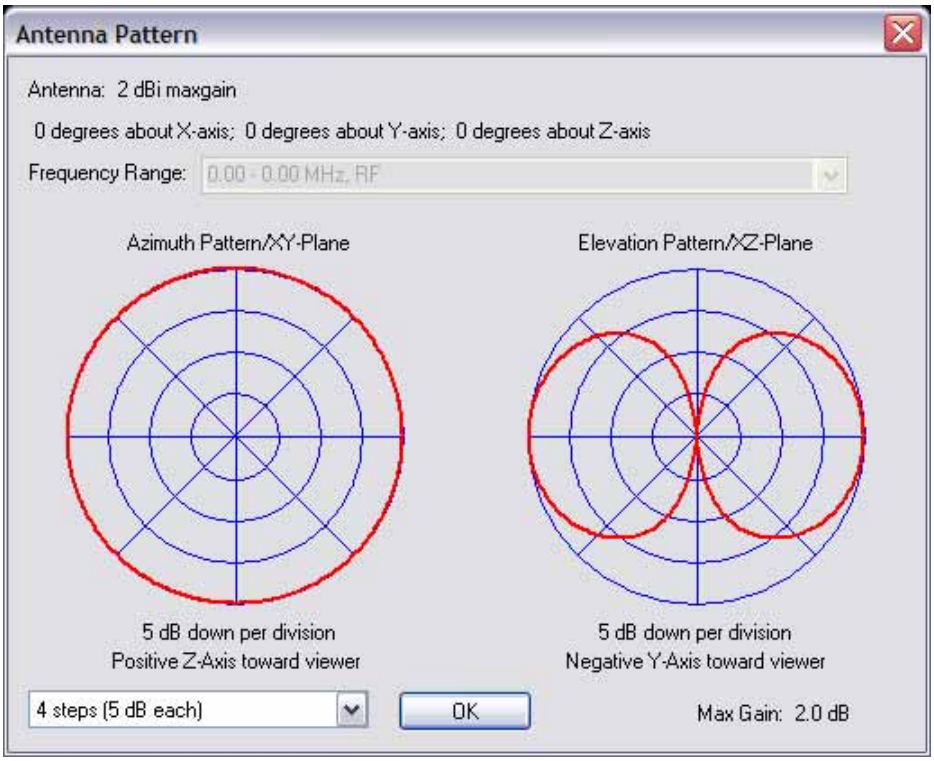

Antenna Pattern
Antenna: 2 dBi maxgain
0 degrees about X-axis; 0 degrees about Y-axis; 0 degrees about Z-axis
Frequency Range: 0.00 - 0.00 MHz, RF
Azimuth Pattern/XY-Plane
Elevation Pattern/XZ-Plane
5 dB down per division
Positive Z-Axis toward viewer
5 dB down per division
Negative Y-Axis toward viewer
4 steps (5 dB each)
OK
Max Gain: 2.0 dB

Figure 5.43: Antenna pattern dialog

- **Inserting Components** - To insert a component into the antenna system, such as a cable between the access point and antenna, right-click on one of the existing components and select **Insert**. Choose a part to insert much as you would choose a part to add. The part will be inserted above the part you originally clicked.

NOTE

Only parts with at least two connectors can be inserted (no point antennas).

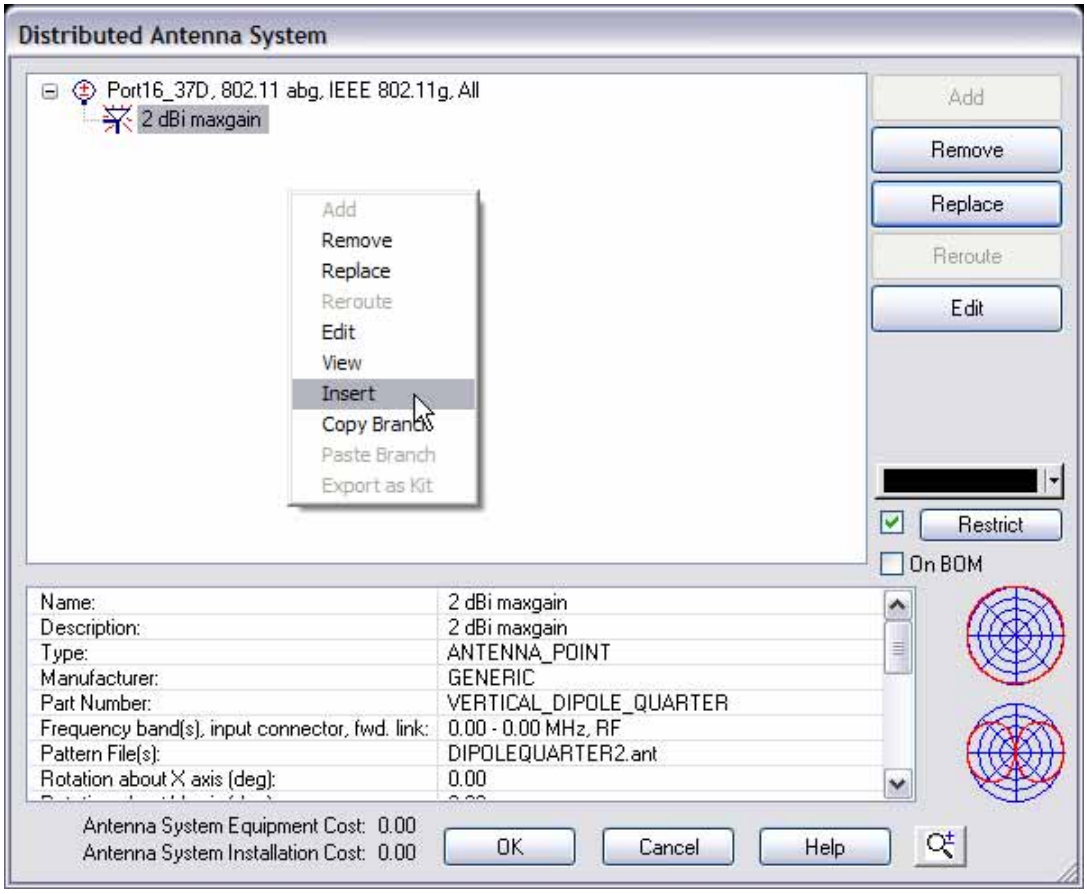


Figure 5.44: Selecting Insert component

Select the component you wish to insert from the **Insert Antenna System Component** list:

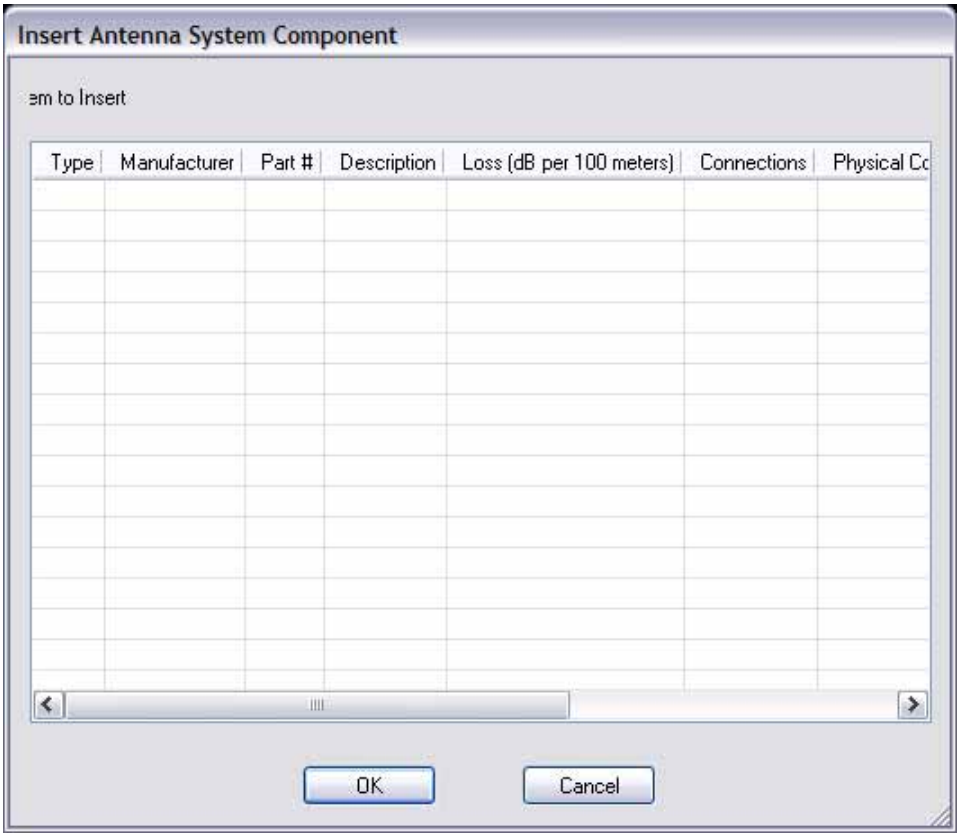


Figure 5.45: Selecting a component for insertion

- **Creating Kits** - To create a new component kit out of a portion of your antenna system, such as a cable and amplifier combination, right click on the topmost component you want to be part of the kit (the part closest to the access point). Select **Export as Kit** from the pop-up menu. The **Define New Component Kit** dialog opens (see Figure 5.47).

NOTE

*A **Component Kit** is a group of components that can be saved (as a kit) and added to a distribution system just like you would add another component. Instead of adding one component, the component kit is added instead.*

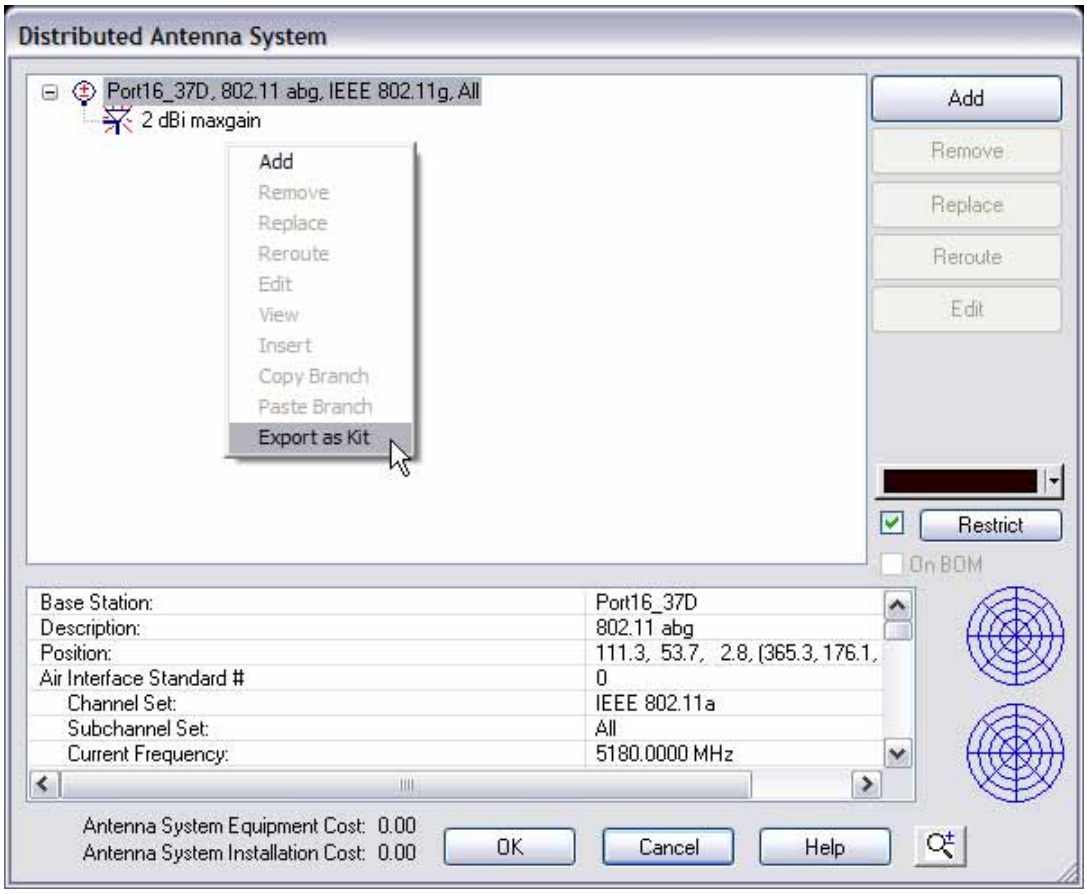


Figure 5.46: Selecting Exporting as Kit

Choose a name for the kit in the **Define New Component Kit** dialog box. The component you selected and all those attached to it form a new kit. You can then add the kit to other portions of the designs. Click **OK** when you are finished.

Figure 5.47: Defining a component kit for export

Access Point Colors

Selecting **Network Design > Access Point Colors** displays the dialog box in Figure 5.49.

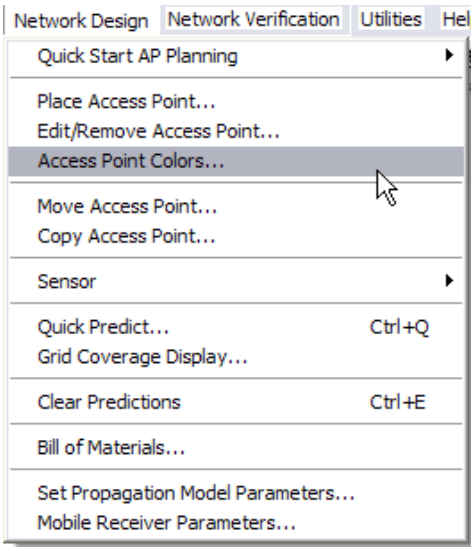


Figure 5.48: Selecting Access Point Colors

The **Color Override** dialog allows you to override the default colors of access points based on selection criteria. Set your desired color selection criteria by choosing an option from the drop-down menu. The list of items for that criteria will automatically update in the dialog window and will be displayed in the current color for access points of that criteria. Double click on a colored item to change its color.

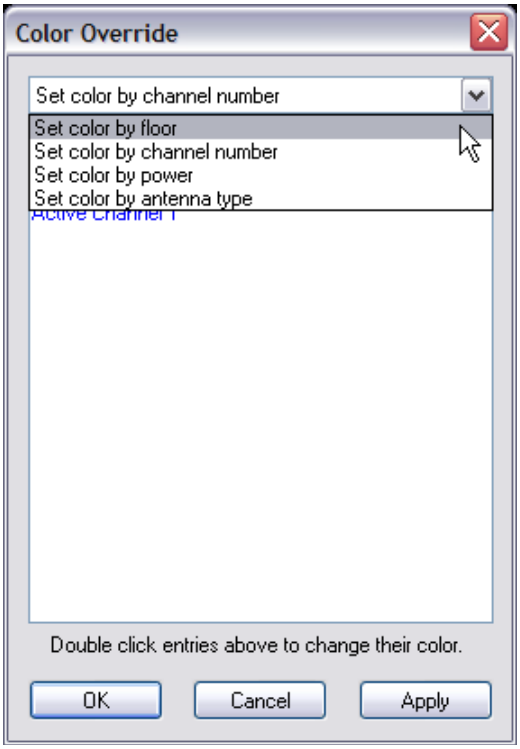


Figure 5.49: Color Override dialog

Move Access Point

Selecting **Network Design > Move Access Point** is a quick way to change the location of an access point which has already been configured. Move Access Point opens the dialog in Figure 5.51.

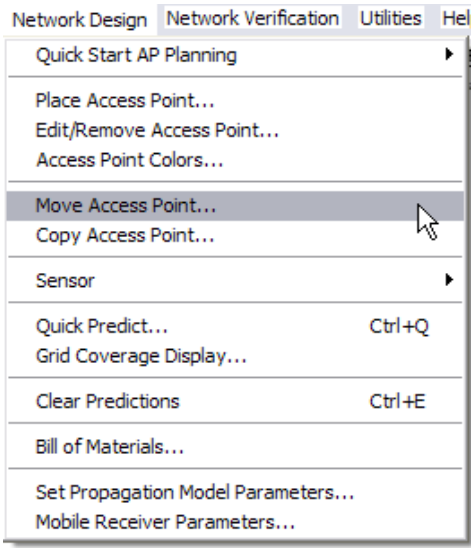


Figure 5.50: Selecting Move Access Point

From the Move Access Point dialog, select the access point that you wish to move and click **Move**. Only access points on the current floor may be moved with this command. To move access points to a different floor, use the Move command on the Edit/Remove Access Point dialog (see “Edit/Remove Access Point” on page 121).

Your pointer will take on the appearance of the access point that you selected from the list. Move the Access Point to the desired location and click to place it. You may also move multiple access points simultaneously by selecting more than one access point before clicking Move. Click **Finished** after moving access points.

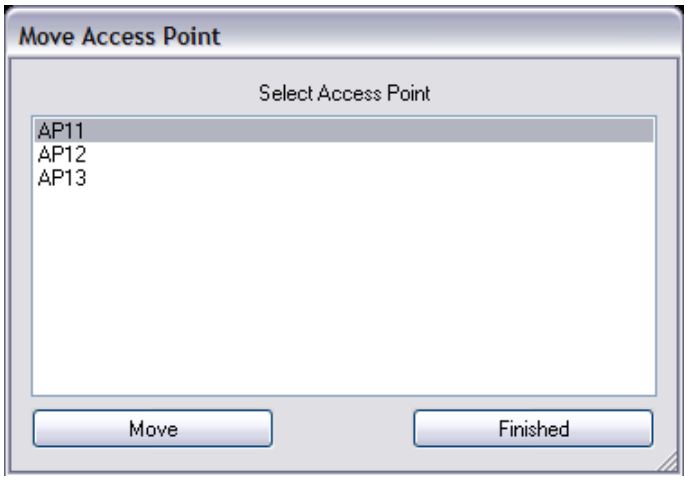


Figure 5.51: Move Access Point dialog

Another way to move access points is through the Access Point Positioning prediction mode (see “Access Point Positioning” on page 159). This function allows you to visualize the coverage footprint of your access point as you move it to a new location. This is much faster than continued repositioning and repeated simulation of the new location and can help you intelligently select a new location for your access point.

Copy Access Point

The Copy Access Point menu command works very similar to the Move Access Point command. To copy one or more access points on a floor, select **Network Design > Copy Access Point**. The Copy Access Point dialog box opens (Figure 5.53).

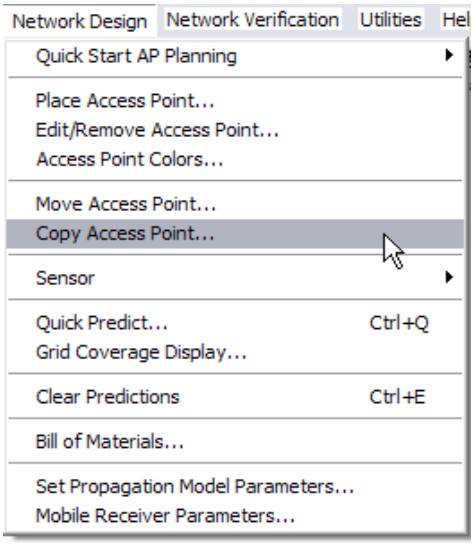


Figure 5.52: Selecting Copy Access Point

Select the access point you want to copy from the Copy Access Point dialog and then press the **Copy** button. Click in the drawing to specify the location where you want the access point copied to. Continue clicking to make additional copies, or end the operation by right-clicking or by pressing the **ESC** key. This returns you to the Copy Access Point dialog, then click **Finished**.

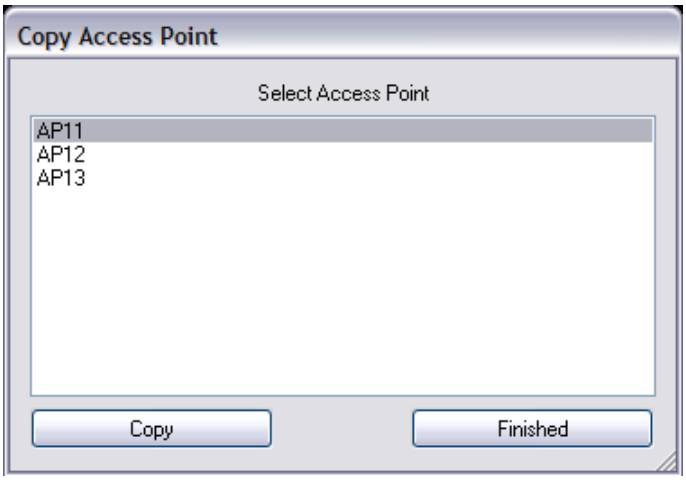


Figure 5.53: Copy Access Point dialog

Managing Sensors

Placing Sensors

Sensors are RF detectors used in a wireless network designs to monitor RF activity in your network environment. This feature is a key enabler for wireless asset tracking. LANPlanner Solo allows you to place sensors within your building drawing. To do this, select **Network Design** > **Sensor** > **Place Sensor**:

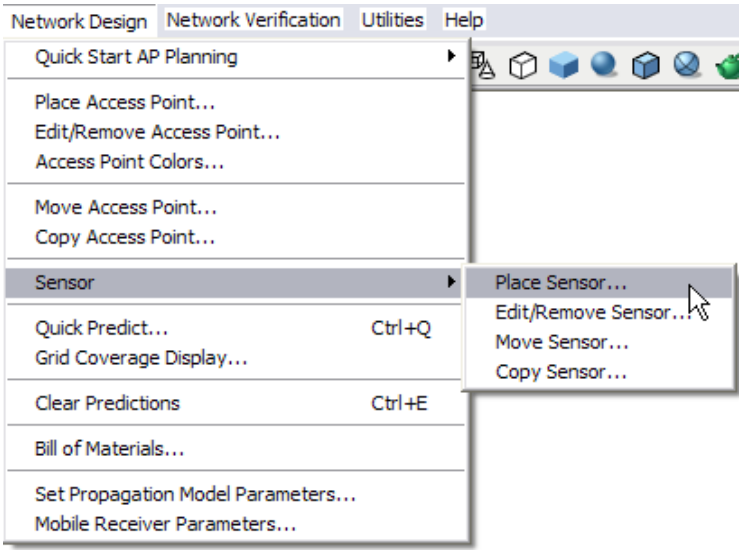


Figure 5.54: Selecting Place Sensor

To place sensors in the drawing, double left click the hardware description in the **Place Network Sensor** dialog and then left click at the location in the drawing where you would like the sensor placed. You may continue to place multiple sensors by clicking in the drawing again.

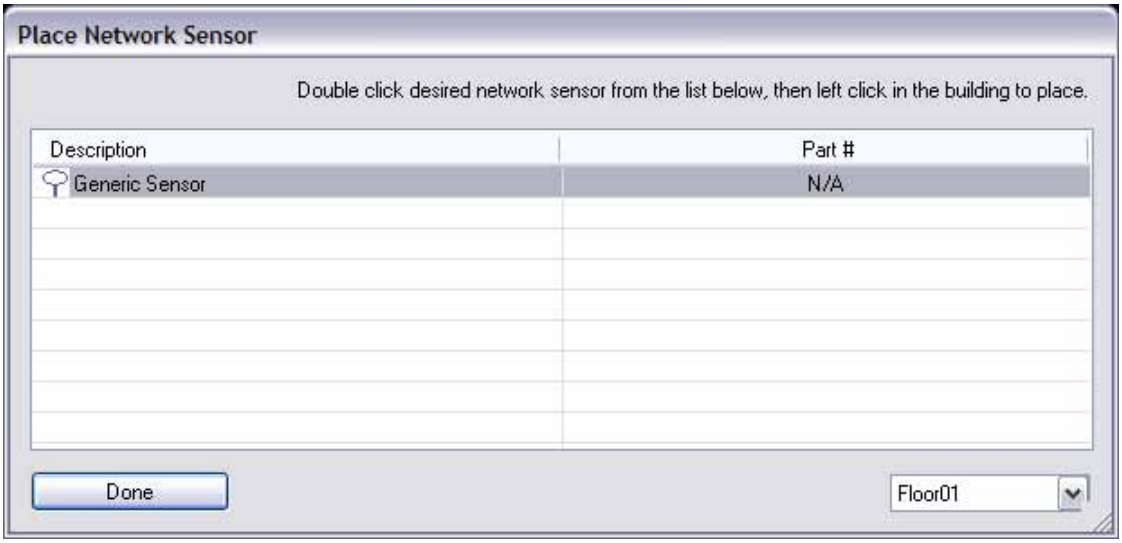


Figure 5.55: Place Network Sensor dialog

During sensor placement, your mouse cursor takes on the appearance of a sensor. Click on the areas in your drawing where you want sensors placed. When finished, right-click or press the **ESC** button

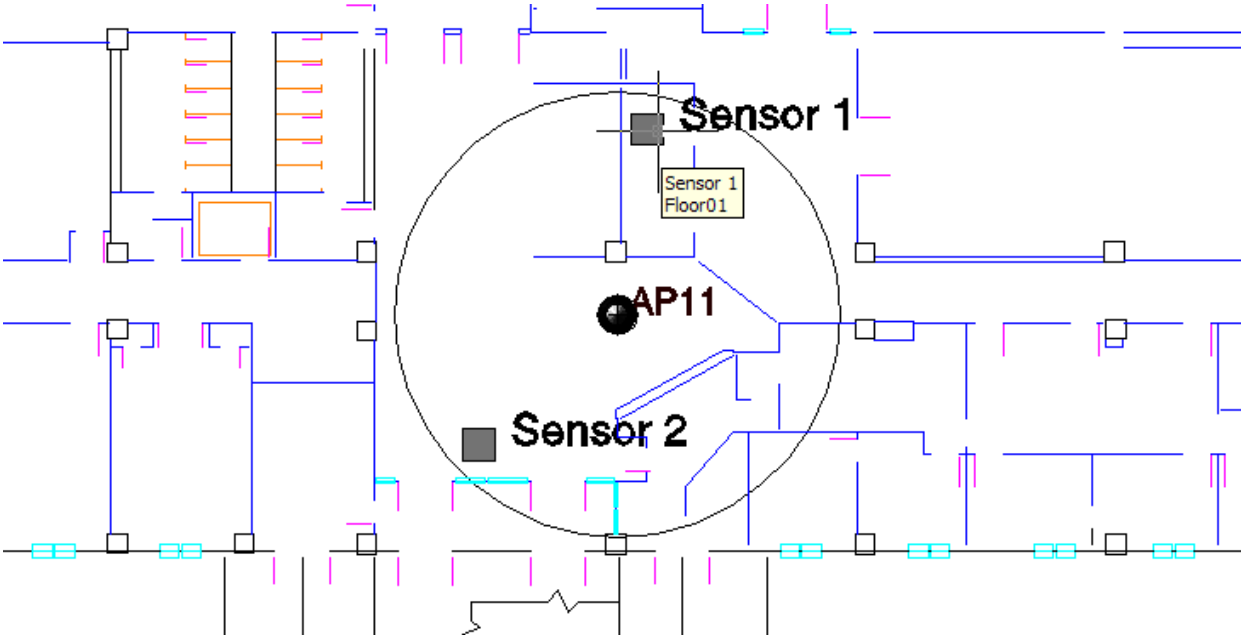


Figure 5.56: Placed Sensors

NOTE

Sensors assume a uniform client transmit power across the drawing for sensor predictions. You can set this in the Mobile Receiver Parameters dialog (see "Setting Mobile Receiver Parameters" on page 187).

Editing/Removing Sensors

After manual sensor placement, you can edit and remove sensors from your building drawing by selecting **Network Design > Sensor > Edit/Remove Sensor**. The Edit/Remove Sensor dialog box opens (Figure 5.58).

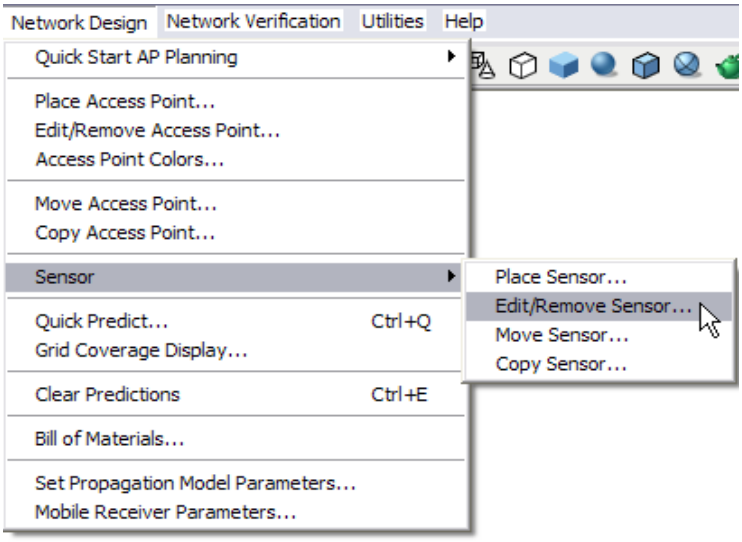


Figure 5.57: Selecting Edit/Remove Sensor

Choose the sensor you wish to remove, then select **Remove Sensor**. Double click on a sensor to edit its name, location, or sensor height. You can also toggle the sensor display on or off by selecting the **Show Network Sensors on drawing** checkbox. Click **Done** when you are finished.

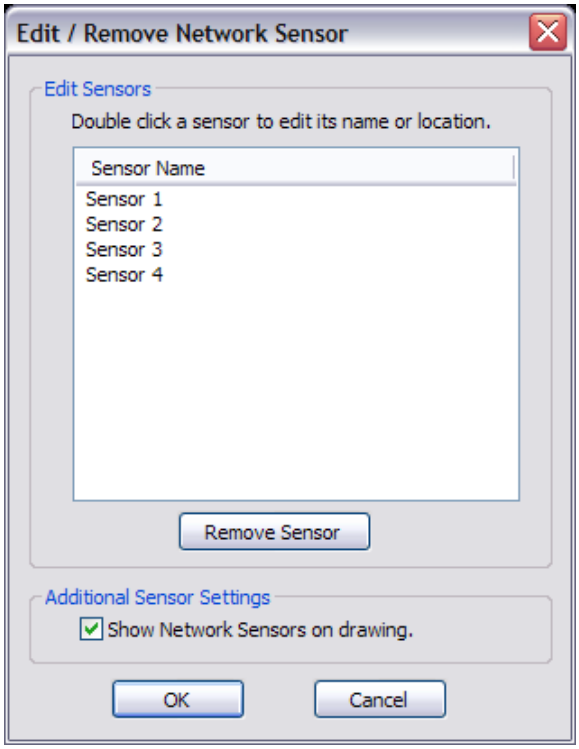


Figure 5.58: Edit/Remove Sensor dialog

Moving Sensors

The Move Sensor command is a quick way to change the location of a sensor which has already been placed. To do this, select **Network Design > Sensor > Move Sensor**. The Move Sensor dialog box opens (Figure 5.60).

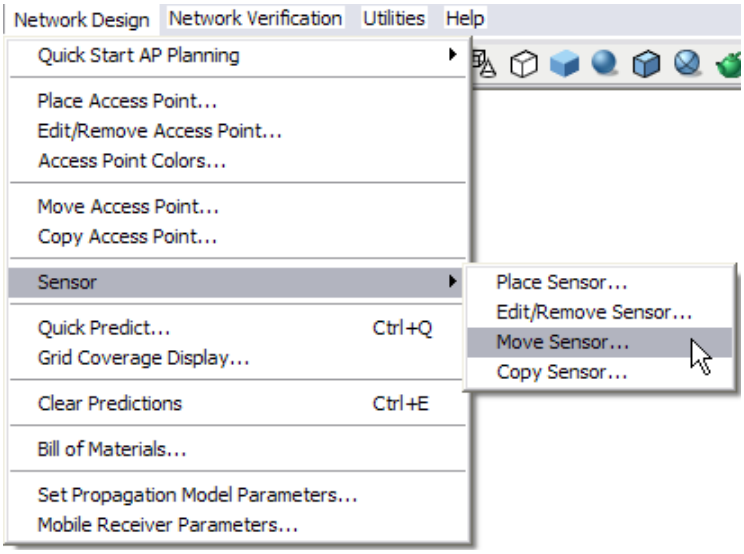


Figure 5.59: Selecting Move Sensor

From the Move Sensor dialog, select the sensor that you wish to move and click **Move**. Your pointer will take on the appearance of the sensor that you selected from the list. Move the sensor to the desired location and left-click to place it. You may also move multiple sensors simultaneously by selecting more than one sensor before clicking Move. Click **Finished** after you are done moving sensors.

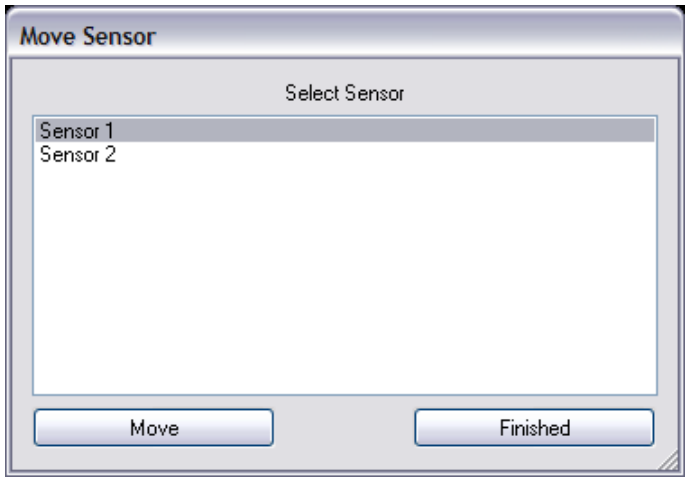


Figure 5.60: Move Sensor dialog

Copying Sensors

The Copy Sensors menu command works very similar to the Move Sensor command. To copy one or more sensors on a floor, select **Network Design > Sensor > Copy Sensor**. The Copy Sensor dialog box opens (Figure 5.62).

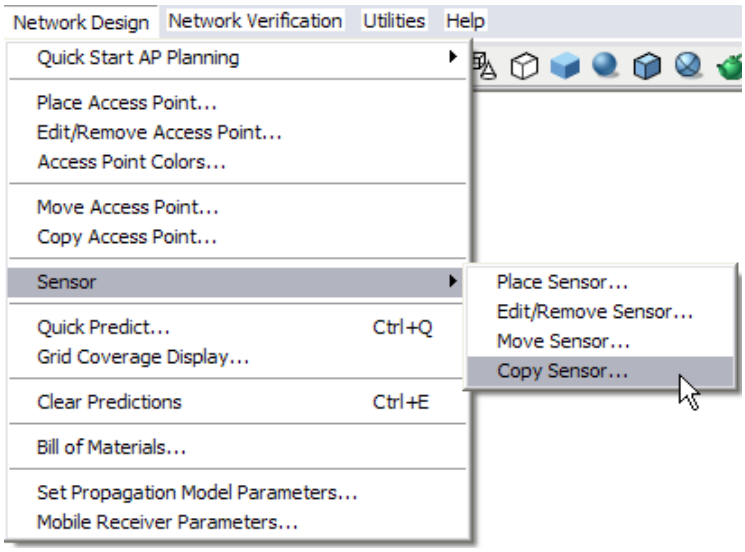


Figure 5.61: Selecting Copy Sensor

Select the sensor you want to copy from the Copy Sensor dialog and then press the **Copy** button. Click in the drawing to specify the location you want the sensor copied to. You may also copy multiple sensors simultaneously by selecting more than one sensor before clicking Copy. Press the **ESC** key to return to the Copy Sensor dialog, then click **Finished**.

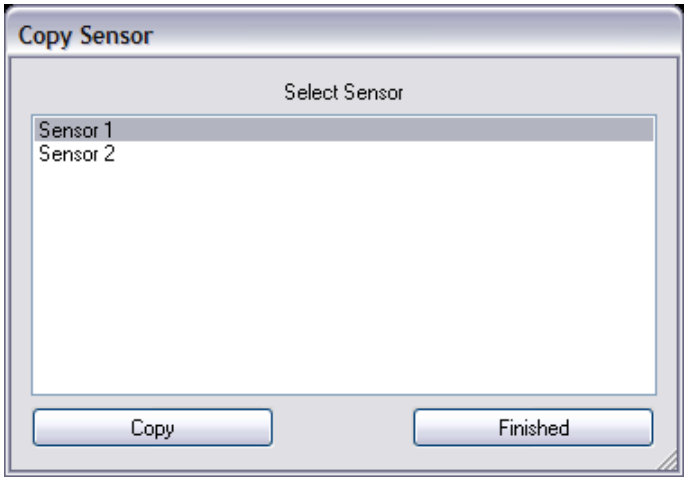


Figure 5.62: Copy Sensor dialog

Running Quick Prediction

LANPlanner Solo employs powerful 3D prediction modes that use a RF Propagation model and site-specific information to simulate wireless network performance. Each prediction mode is unique and powerful in its own way. To make use of these predictive modes, you must have already positioned access points and/or sensors in the drawing. All prediction modes share a common starting point. To Access the Quick Predict dialog, select **Network Performance > Quick Predict**. Quick Predict dialog opens (Figure 5.64).

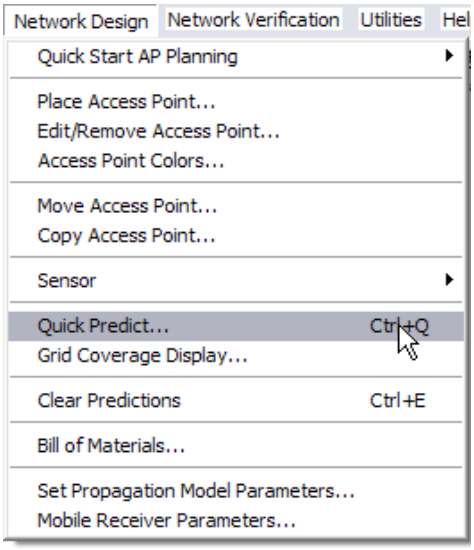


Figure 5.63: Selecting Quick Predict

Quick Prediction Settings - Access Points

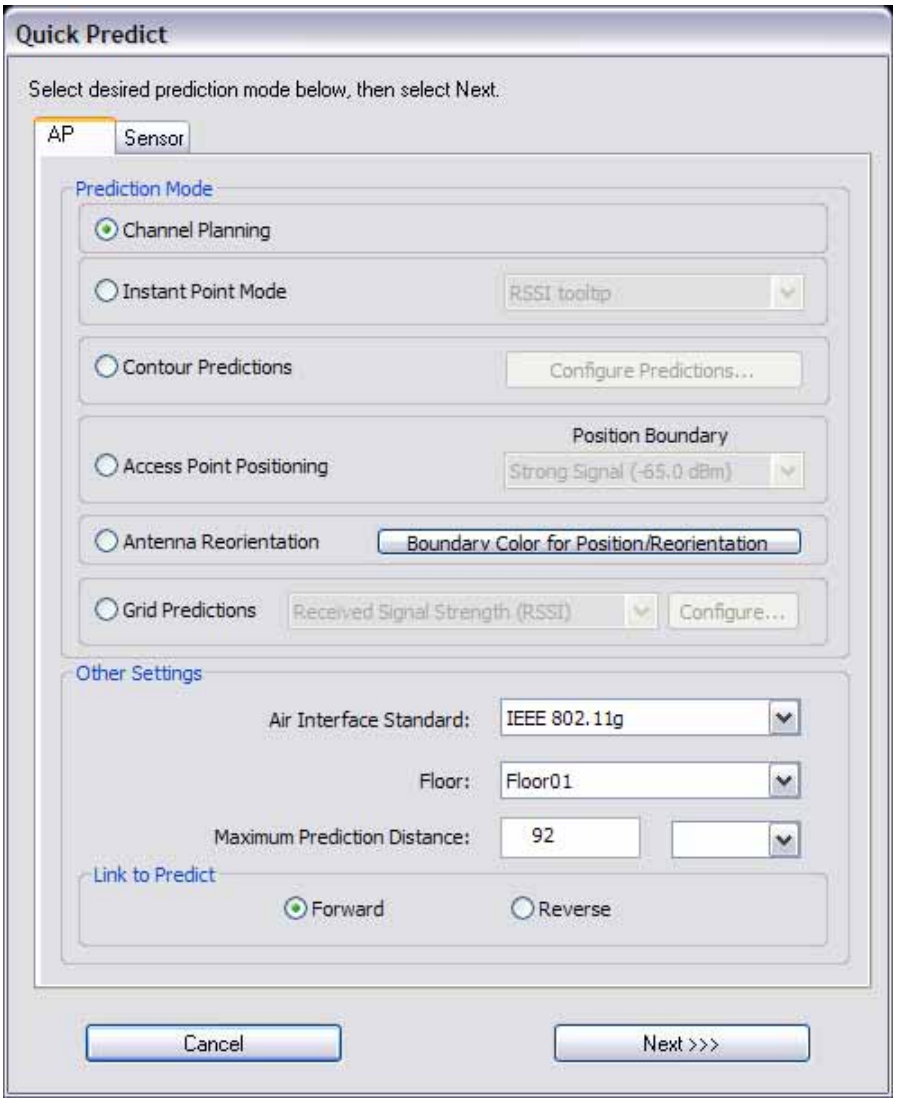


Figure 5.64: Quick Predict dialog (AP tab)

To run Quick Prediction for access points, first choose the floor for which you would like to run a prediction from the pull down floor combo box. Next, select your desired prediction mode by clicking the button next to that mode and configuring any additional options from the pull-down or button next to the mode you selected. See the following sections for more detail:

- “Channel Planning” on page 153
- “Instant Point Mode” on page 154
- “Contour Predictions” on page 156
- “Access Point Positioning” on page 159
- “Antenna Reorientation” on page 161
- “Grid Predictions” on page 163

- Use the **Other Settings** options in section “Other Settings/Link to Predict” on page 166 to configure which air interface standard will be used in predictions involving multi-standard access points.

Channel Planning

The Channel Planner is an automated system planning facility in Quick Predict that automatically assigns transmit frequencies (channels) to your transmitters in a layout that minimizes interference between transmitters. Selecting **Next** after selecting the **Channel Planning** mode in the Quick Predict Dialog initiates the Channel Planner dialog, shown below:

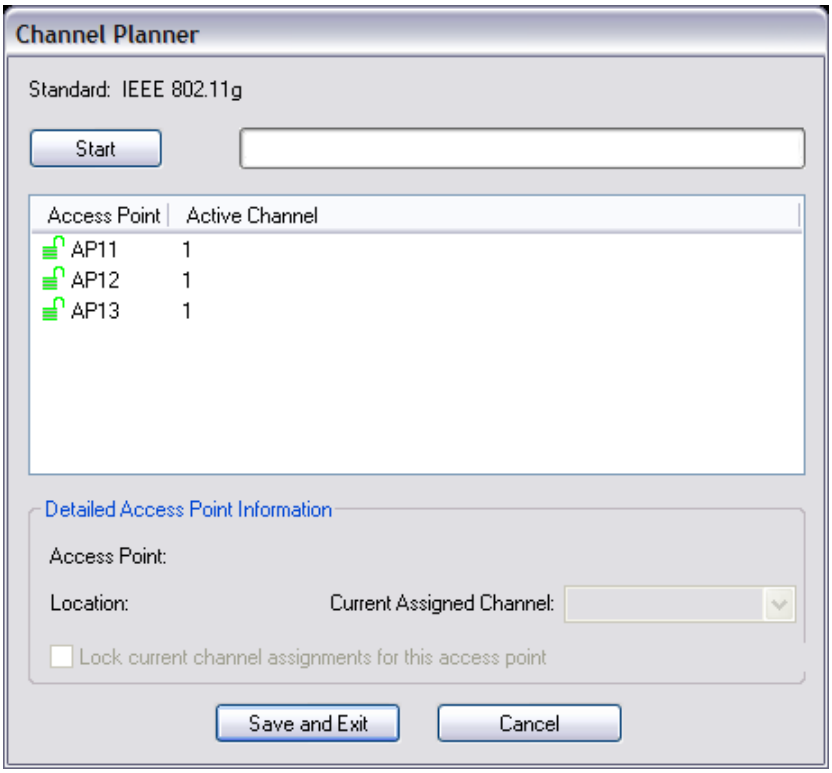


Figure 5.65: Channel Planner dialog

For each access point, the name and active channel are displayed. There is padlock icon beside each access point name. If the padlock icon is red and `locked' then the Channel Planner will not alter the channel for the relevant access point during interference analysis. If the padlock icon is green and `unlocked' then the Channel Planner will assign a channel to the access point that minimizes the total interference in the design.

To change whether an access point is a candidate for having its channel altered, either double-click on the padlock icon, or single click on the access point in the list and then check the **Lock current channel assignments...** checkbox in the Detailed Access Point Information panel. If you decide to lock an access point on a certain channel, be sure to set that channel yourself using the **Current Assigned Channel** combo box drop-down menu.

When you are done selecting which access points will be excluded from the channel planning process, and assigning their channels, press the **Start** button. The channel planner will automatically assign channels to the candidate access points. Note that this process may take some time, and becomes more time-consuming as the number of access points increases.

The result will be an updated list of access points, indicating the new active channel for each access point. Once you have a satisfactory set of channels, you can use the **Save and Exit** button to store the channel set assignments

into the access points in your drawing. If you would like to discard the proposed channel plan without updating your drawing, click **Cancel**.

Instant Point Mode

Instant Point Mode allows you to convert your mouse cursor into the mobile user and display system performance from the mobile user's perspective.

The Instant Point Mode prediction will predict the mobile user's RSSI (Received Signal Strength), SIR (Signal-to-Interference Ratio), and throughput (data rate). Before you begin the Instant Point Mode prediction, you may select the item you would like displayed as the mouse cursor tool tip from the pull-down menu next to the **Instant Point Mode** radio selection.

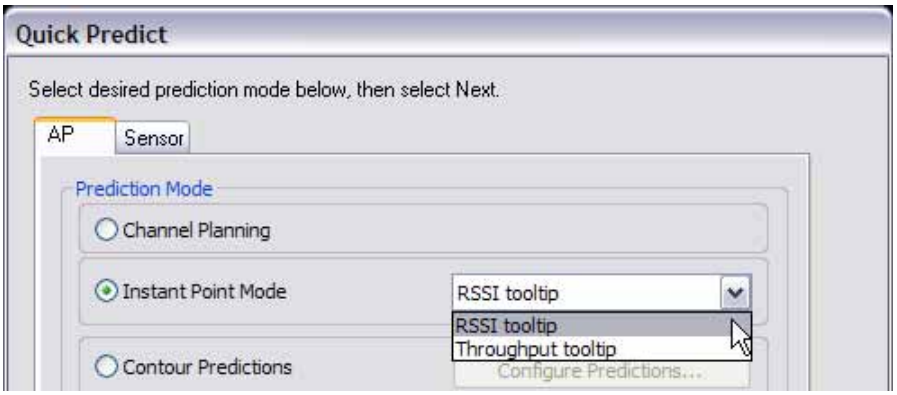


Figure 5.66: Instant Point Mode tool tip options

Keep in mind that all items mentioned above will be predicted, not just what you set as the tool tip.

A screen capture of a sample Instant Point Mode prediction is shown below. **Forward Link Composite Prediction** is shown in table format, with each table data point also displayed in bar graph form (Peak Data Rate, SINR, and RSSI):

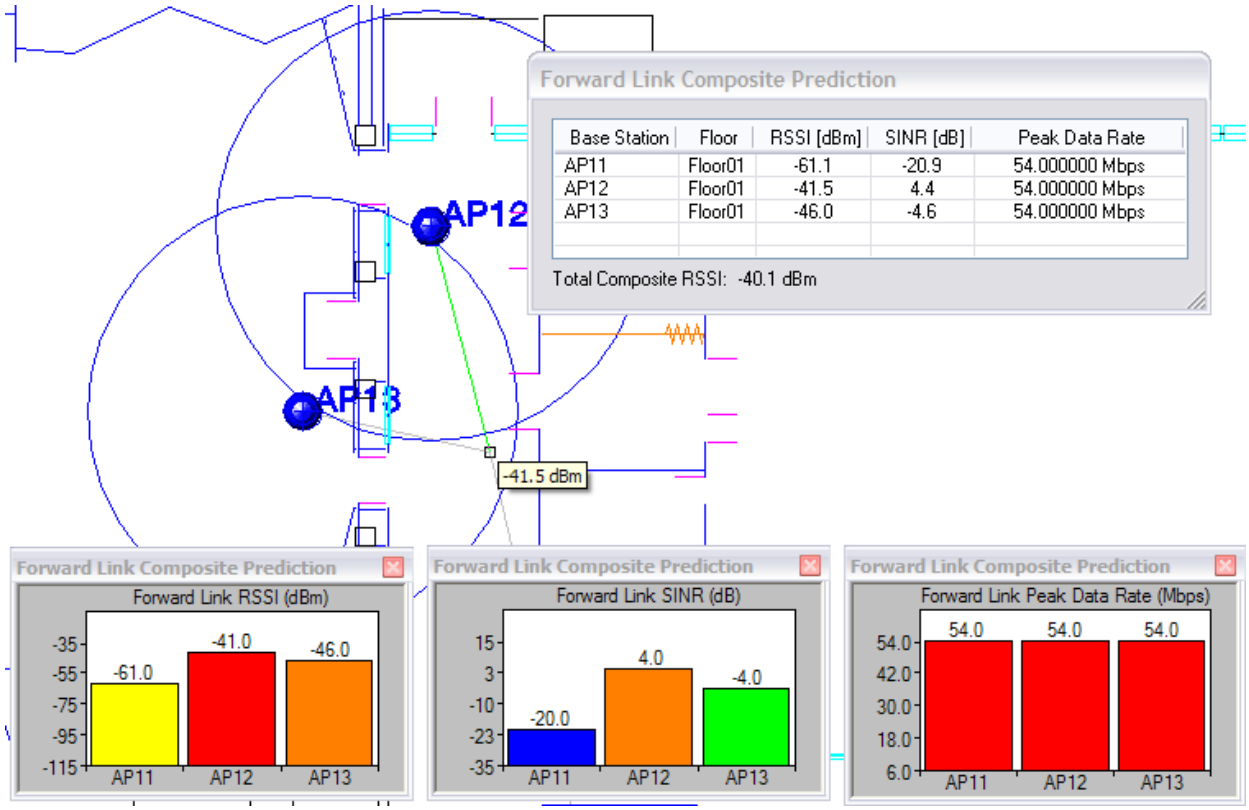


Figure 5.67: Instant Point Mode prediction with RSSI selected

You can generate new Instant Point Mode data points interactively by moving your mouse pointer to different locations in the drawing, simulating a mobile receiver's location. The prediction values update dynamically, and a tool tip box displays the RSSI value at the current mouse pointer. A green line connecting the mobile receiver to an access point indicates that the this particular access point is providing the mobile receiver with the strongest signal at that receiver's current location.

Contour Predictions

The Coverage Contours prediction mode allows you to view boundary regions where a certain level of RSSI (Received Signal Strength), SIR (Signal-to-Interference Ratio), SNR (Signal-to-Noise Ratio), or throughput (data rate) occurs. The boundaries are displayed as enclosed contours directly on the drawing.

To configure contours, first choose the **Contour Predictions** radio button on the Quick Predict dialog (Figure 5.68). Next, click the Configure Predictions button. The dialog in Figure 5.69 will be displayed.

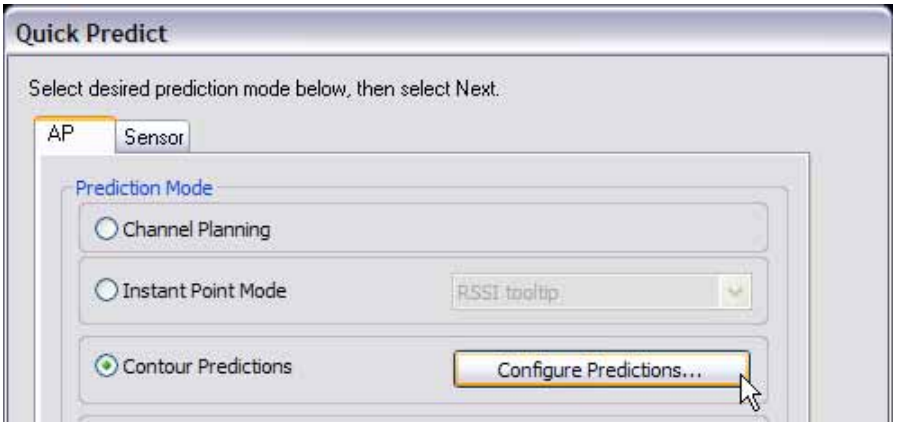


Figure 5.68: Selecting Contour Predictions

From the **Contour Specification Dialog Box** you can select an item to predict, such as signal strength (RSSI), signal-to-interference (SIR), signal-to-noise ratio, or peak data rate. For the item you choose to predict, select the **Configure Contours** button. The dialog in Figure 5.70 displays.

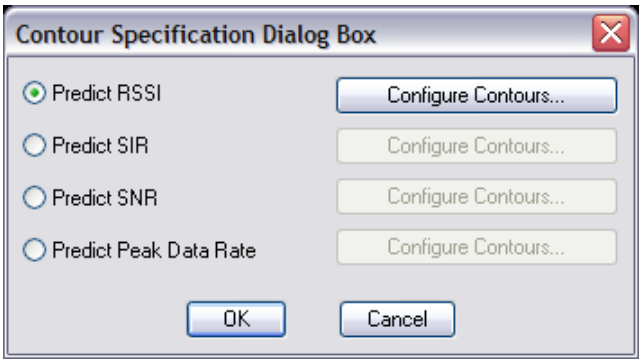


Figure 5.69: Contour Specification dialog

NOTE

If the maximum prediction distance is less than where a specified contour boundary actually occurs, it will be drawn but end prematurely at the maximum prediction distance.

Up to three contour boundaries may be predicted for each access point. Enter the value of the innermost contour to predict, and then enter the spacing between each successive contour. With the selections shown, contours at -50 dBm, -60 dBm, and -70 dBm will be displayed. To choose a color for each contour, click the **Configure Colors** button.

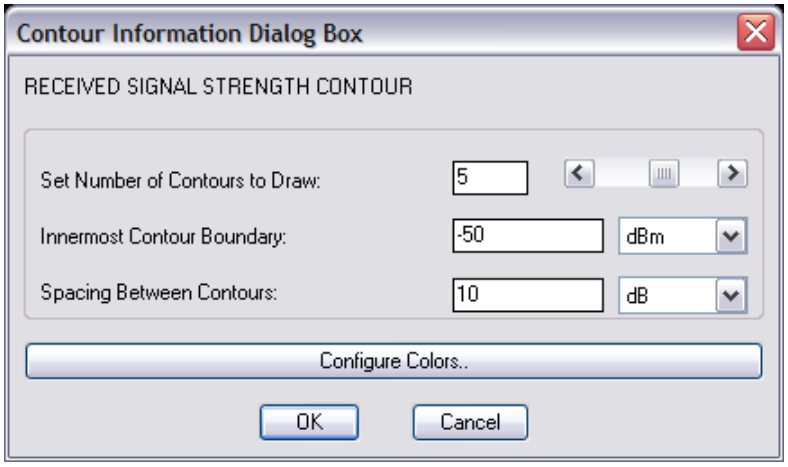


Figure 5.70: Contour Information dialog

NOTE

A forward link prediction indicates system performance from the view of the mobile receiver's perspective, specifically the signal transmitted from the access point to the mobile user. A reverse link prediction measures the signal transmitted from the mobile user back to the access point. See "Setting Mobile Receiver Parameters" on page 187 for further details.

An example of a Contour Coverage prediction is shown below:

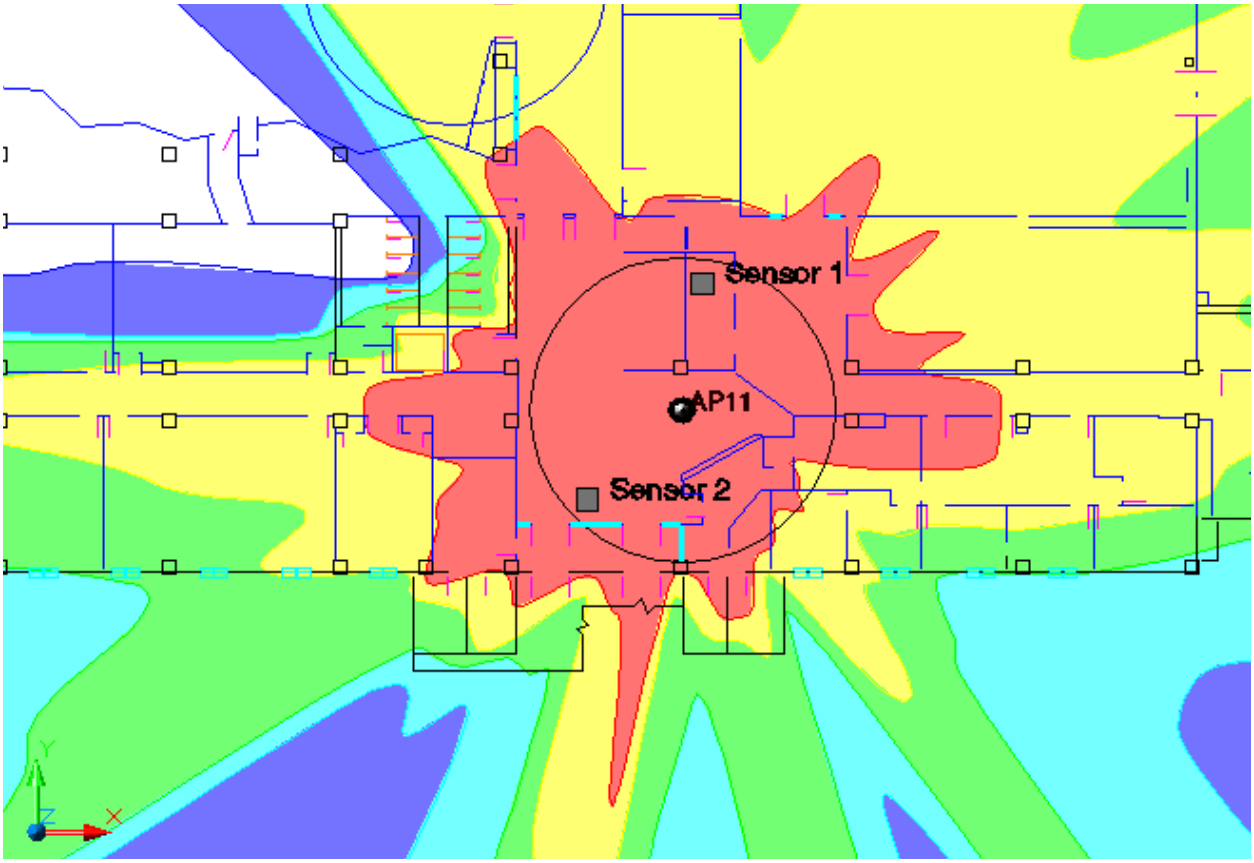


Figure 5.71: Access Point Coverage Contour example

To clear the results of a prediction from the screen, select **Network Design > Clear Predictions** from the LANPlanner Solo toolbar

NOTE

*Coverage contours are only displayed as shaded when in 2D wireframe shading mode (**View > Shade > Flat Shaded, Edges On**).*

Access Point Positioning

Access Point Positioning Mode assists you in determining the ideal locations for your access points. In this mode, you use your mouse cursor to move access points in real time and view system performance given the new access point position.

To use this prediction mode, select **Access Point Positioning** from the Quick Predict dialog and choose a position boundary from the drop-down list shown below in Figure 5.72. The position boundary selects the signal strength at which the contour around the access point will be drawn. This contour will is recalculated as you change the position of the access point. Click **Next** to begin positioning access points.

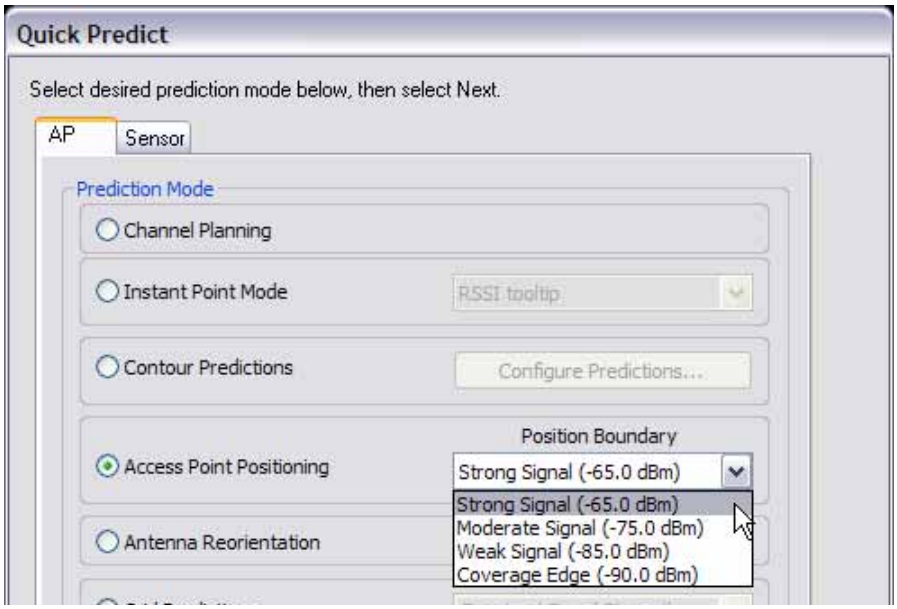


Figure 5.72: Access Point Positioning Mode

To select an access point to position, left-click it in the drawing. The access point will move as you move the mouse cursor. To place the access point in a new location, left-click again in the drawing. You can continue to click to select and click to place, press **ESC** or right-click to finish. An example of an Access Point Positioning prediction is shown below:

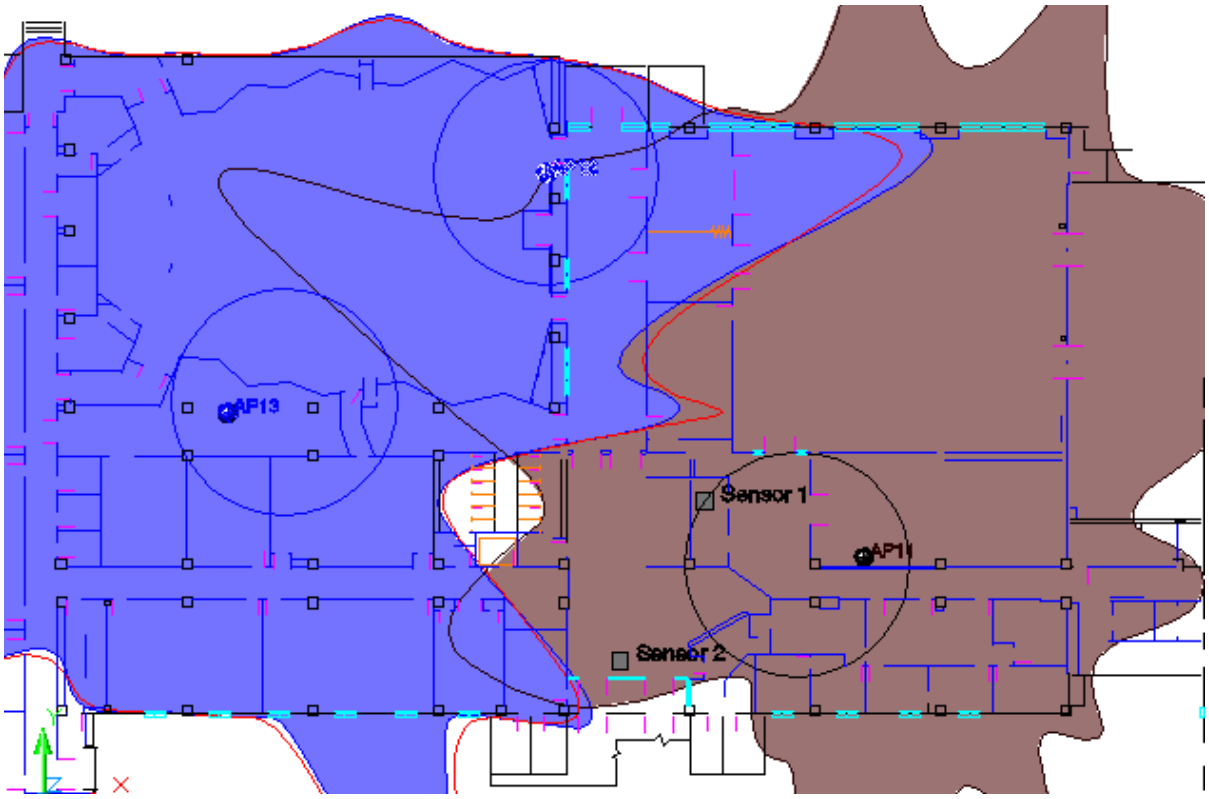


Figure 5.73: Access Point Positioning Mode prediction

To clear the results of a prediction from the screen, select **Network Design > Clear Predictions** from the LANPlanner Solo toolbar.

Antenna Reorientation

The Antenna Reorientation mode assists you in determining the ideal orientation for your access point antennas. In this mode, you use a slider control change the orientation of the antenna while the signal coverage pattern is updated in real time.

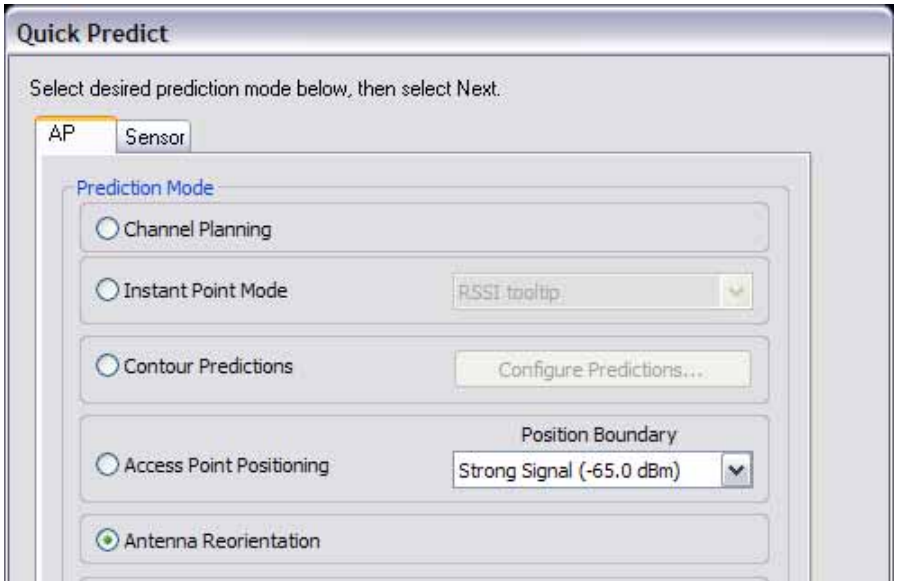


Figure 5.74: Selecting Antenna Reorientation prediction

After selecting the **Antenna Reorientation** option in the Quick Predict dialog and clicking **Next**, left-click to select an access point in the drawing. The dialog in Figure 5.75 opens. This figure shows the top down view of the antenna pattern (Azimuth Pattern/XY-Plane) and the front view (Elevation Pattern/XZ-Plane).

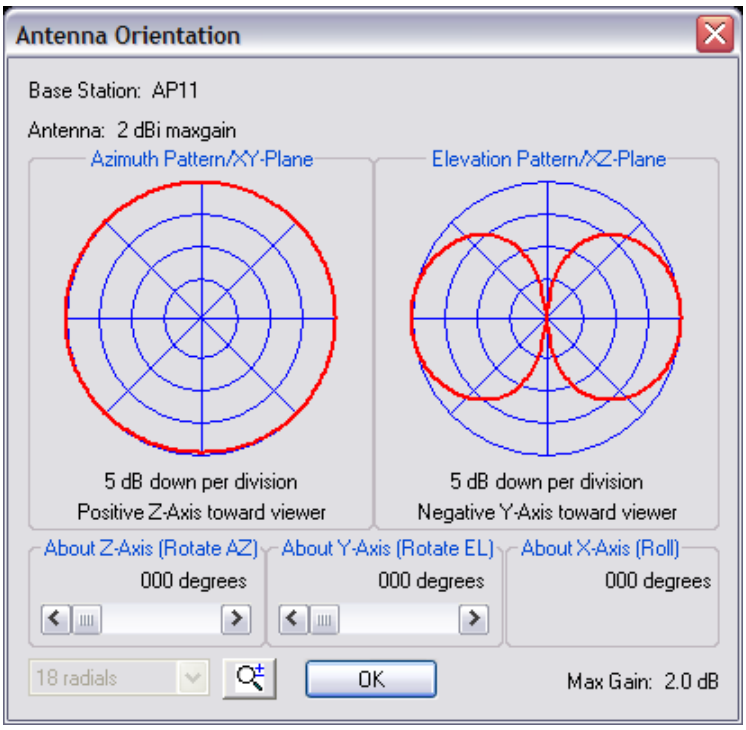


Figure 5.75: Antenna Orientation dialog

Use the sliders at the bottom of this dialog to rotate the antenna specific degree amounts in the direction desired. The signal strength coverage boundary will automatically update on the drawing in real time when you change the orientation of the antenna. Once you are satisfied with the access point's orientation, press the **ESC** key to exit this prediction mode.

NOTE

Access Point Orientation mode is only beneficial for access points that do not have perfect spherical radiation patterns such as directional antennas.

Grid Predictions

Grid Prediction mode allows you to visualize the grid coverage for a selected set of access points. The result is a fluctuating region of color and elevation that represents the combined effect of the selected access points within the identified region. Grid coverage predictions are generally more computationally intensive than other predictive modes, however, they may also provide significantly more information about the performance of your wireless network.

After selecting the **Grid Predictions** option in the Quick Predict dialog, a drop-down menu opens, which allows you to select the Grid Prediction mode you plan on simulating (Figure 5.76).

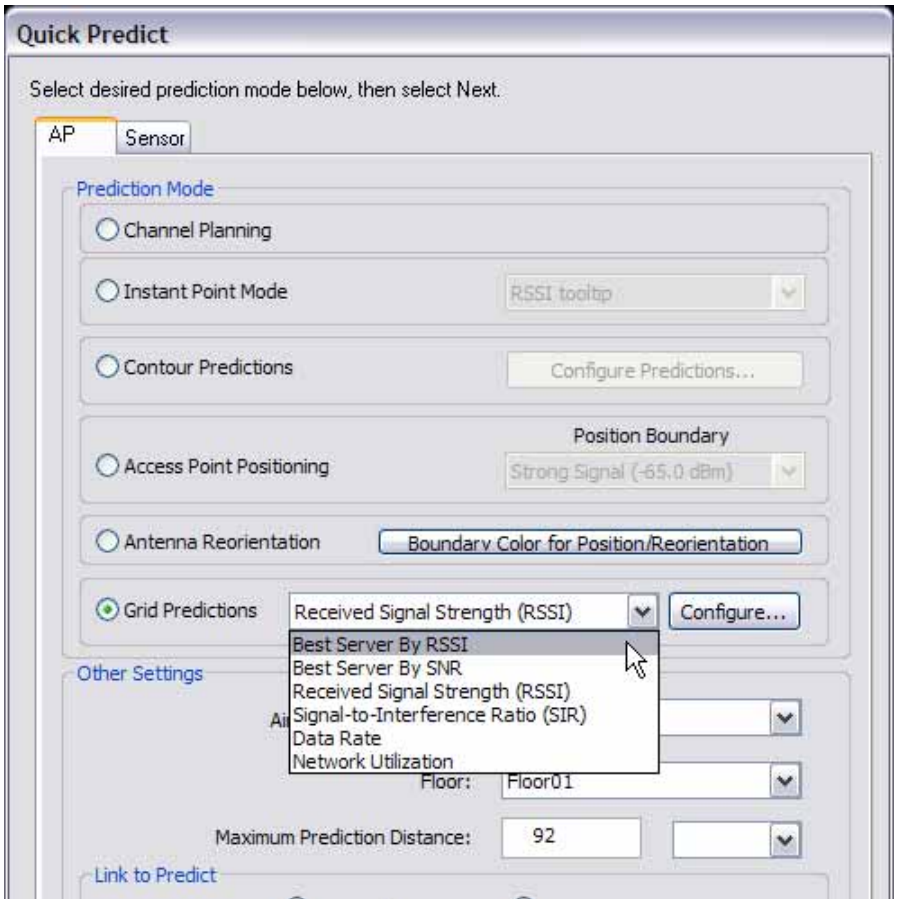


Figure 5.76: Grid Predictions options

The **Grid Predictions** drop-down menu options include:

- **Best Server by RSSI** - The best (strongest) serving access point judged by predicted received power is calculated and displayed for each grid bin.
- **Best Server by SNR** - The best (strongest) serving access point judged by predicted SNR is calculated and displayed for each grid bin.
- **Received Signal Strength (RSSI)** - Displays the RSSI for only the best server at each grid bin.
- **Signal to Interference Ratio (SIR)** - Displays the SIR for only the best server at each grid bin.
- **Data Rate** - Displays the data rate at each grid bin. The highest data rate from all transmitters is the displayed value.

- **Network Utilization** - Displays the percentage of network utilization for the best serving access point at each grid bin. These AP loads are determined by the throughput regions defined in the drawing (see “Specifying Requirement Regions” on page 111).

Clicking **Next** from the Quick Predict dialog opens the **Select Access Points** dialog (Figure 5.77). Select an individual access point, or multiple access points by holding down the left mouse button while highlighting the desired access points. After selecting the access point(s) you wish to include in the prediction, click the **OK** button.

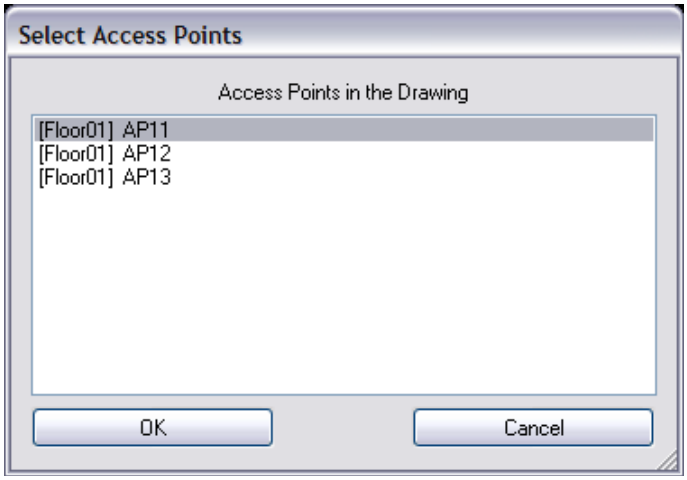


Figure 5.77: Selecting Access Points for Grid Prediction

A pop-up window displays showing the Grid Prediction progress. You can choose to **Pause** or **Abort** the process:

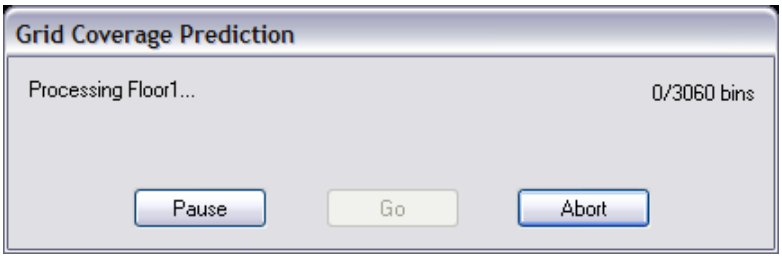


Figure 5.78: Grid Prediction progress

The example below shows a completed Grid Prediction. Use the **Network Design > Grid Coverage Display** command to configure and view Grid Coverage statistics (“Displaying Grid Coverage Results” on page 173).

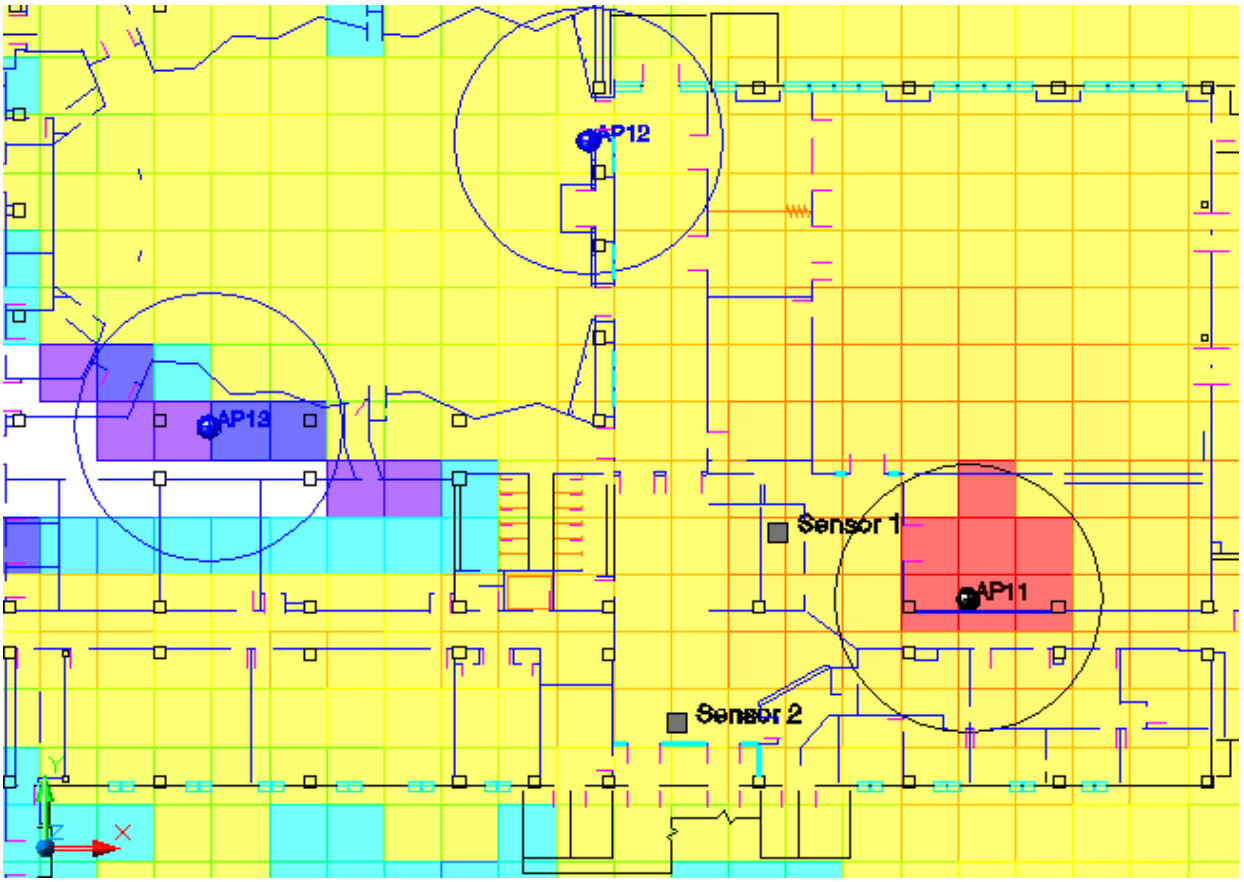


Figure 5.79: Grid Prediction result

Other Settings/Link to Predict

The **Other Settings** option on the Quick Predict dialog (Figure 5.80) allows you to select which **Air Interface Standard**, **Floor**, **Maximum Prediction Distance**, and **Link to Predict** that will be used during prediction.

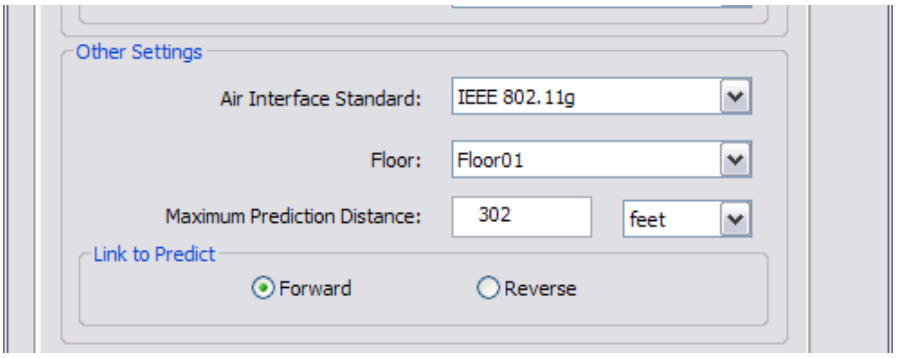


Figure 5.80: Quick Prediction - Other Settings

- **Air Interface Standard** - Contains the air interface standards currently available in the drawing. Only access points with the supported air interface standard will be available for a prediction. For example, if there are two access points in drawing and ap1 supports 802.11a/g, while ap2 supports 802.11g, only ap1 will show up in select access point list if 802.11a is selected.
- **Floor** - The floor for which you would like to run a prediction.
- **Maximum Prediction Distance** - Determines the maximum distance for which the prediction engine will predict signal coverage for. For accurate results, this should typically be set beyond the maximum distance of interest.
- **Link to Predict > Forward** - Select to predict performance from the view of the mobile receiver's perspective, specifically the signal transmitted from the access point to the mobile user.
- **Link to Predict > Reverse** - Select to predict the signal transmitted from the mobile user back to the access point.

NOTE

See "Setting Mobile Receiver Parameters" on page 187 for further details about forward and reverse link predictions.

Quick Prediction Settings - Sensors

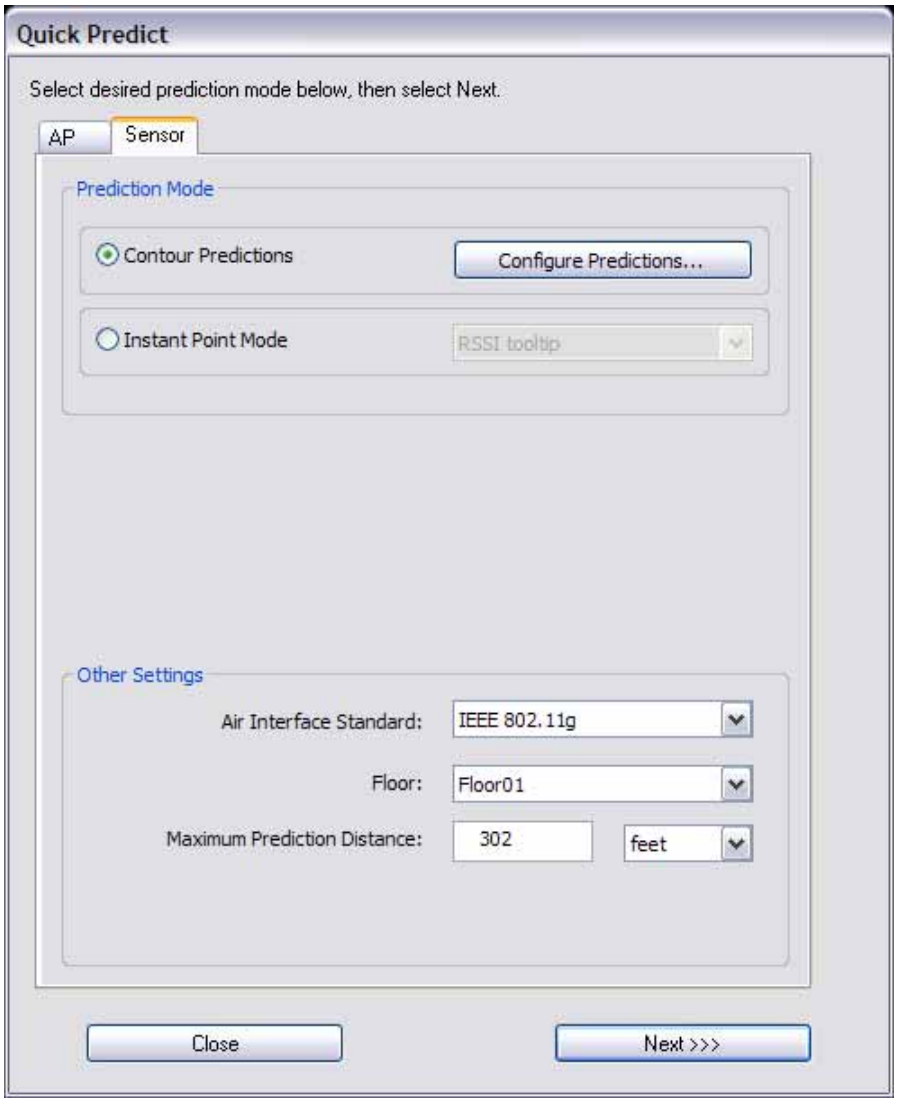


Figure 5.81: Quick Predict dialog (Sensor tab)

To run Quick Prediction for sensors, choose the floor for which you would like to run a prediction from the pull down floor combo box. Next, select your desired prediction mode by clicking on the radio button next to that mode and configuring any additional options from the pull down or button next to the mode you selected. See the following sections for more detail:

- “Contour Predictions - Sensors” on page 168
- “Instant Point Mode - Sensors” on page 171
- Use the **Other Settings** options in section “Other Settings/Link to Predict” on page 166 to configure which air interface standard will be used in predictions involving multi-standard access points and sensors.

NOTE

*Sensor predictions are directly dependent on the power of the mobile clients. You should set the transmit power of mobile client devices before running sensor predictions. This is done by setting **Portable Receiver TX Power** from within the **Mobile Receiver Parameters** dialog (see "Setting Mobile Receiver Parameters" on page 187).*

Contour Predictions - Sensors

The Coverage Contours prediction mode allows you to view boundary regions where a certain level of RSSI (Received Signal Strength), SIR (Signal-to-Interference Ratio), SNR (Signal-to-Noise Ratio), or throughput (data rate) occurs. The boundaries are displayed as enclosed contours directly on the drawing.

To configure contours, first choose the **Contour Predictions** radio button on the Quick Predict dialog (Figure 5.82). Next, click the Configure Predictions button. The dialog in Figure 5.83 displays.

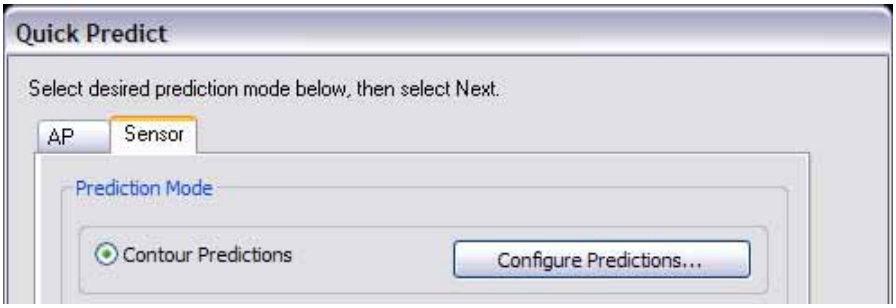


Figure 5.82: Selecting Contour Predictions

From the **Contour Specification Dialog Box** you can select an item to predict, such as RSSI, SIR, SNR, or Peak Data Rate. For the item you choose to predict, select the **Configure Contours** button. The dialog in Figure 5.84 opens.

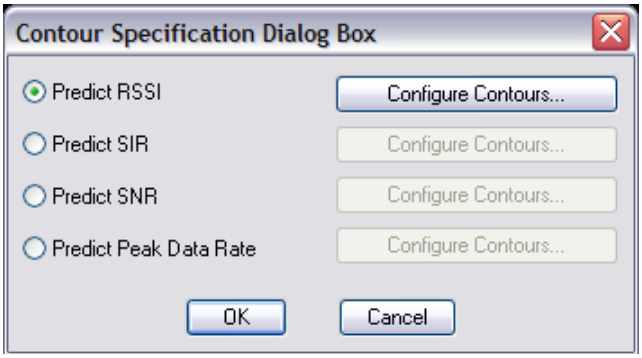


Figure 5.83: Contour Specification dialog

NOTE

Sensor predictions are always reverse link - the power from the mobile client at the point of prediction as seen by the sensor.

Up to three contour boundaries may be predicted for each sensor. Enter the value of the innermost contour to predict, and then enter the spacing between each successive contour. With the selections shown, contours at -50 dBm, -60 dBm, and -70 dBm will be displayed. To choose a color for each contour, click the **Configure Colors** button.

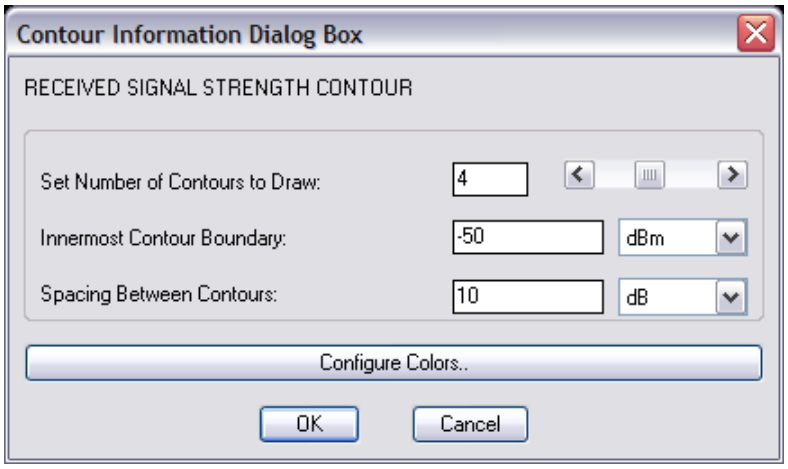


Figure 5.84: Contour Information dialog

Select the sensor(s) from the **Select Sensors** dialog:

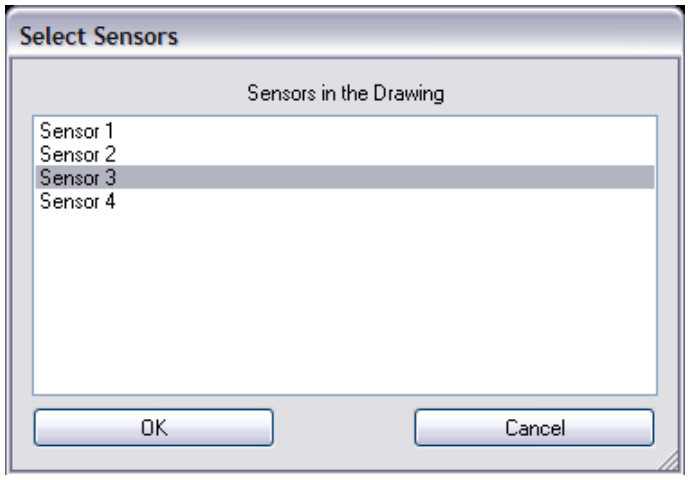


Figure 5.85: Select Sensors dialog

An example of a Contour Coverage prediction is shown below:

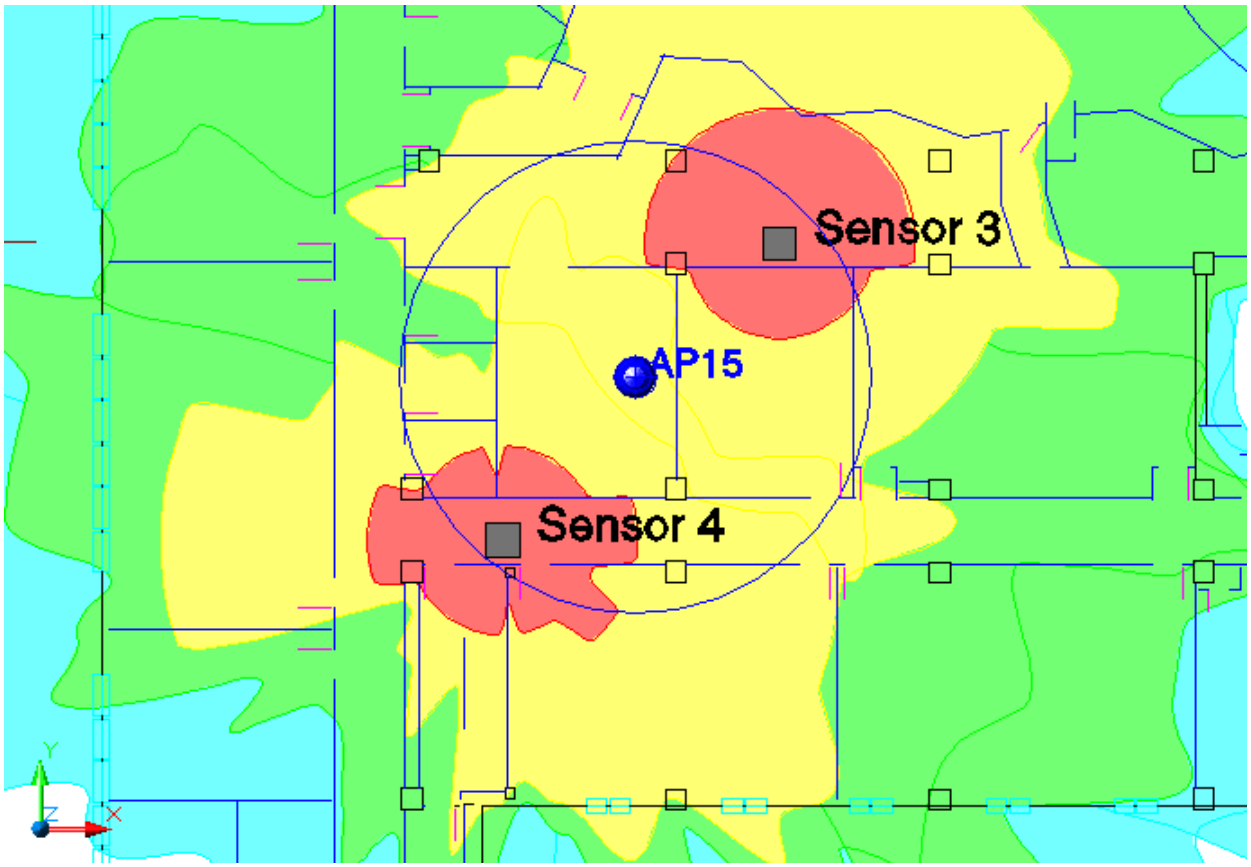


Figure 5.86: Sensor Coverage Contour example

To clear the results of a prediction from the screen, select **Network Design > Clear Predictions** from the LANPlanner Solo toolbar.

Instant Point Mode - Sensors

Instant Point Mode allows you to convert your mouse cursor into the mobile user and display system performance from the mobile user's perspective.

NOTE

A reverse link prediction measures the signal transmitted from the mobile user back to the sensor. Sensor predictions are always reverse link.

The Instant Point Mode prediction will predict the mobile user's RSSI (Received Signal Strength), SIR (Signal-to-Interference Ratio), SNR (Signal-to-Noise Ratio), or throughput (data rate). Before you begin the Instant Point Mode prediction, you may select the item you would like displayed as the mouse cursor tool tip from the pull-down menu next to the **Instant Point Mode** selection.

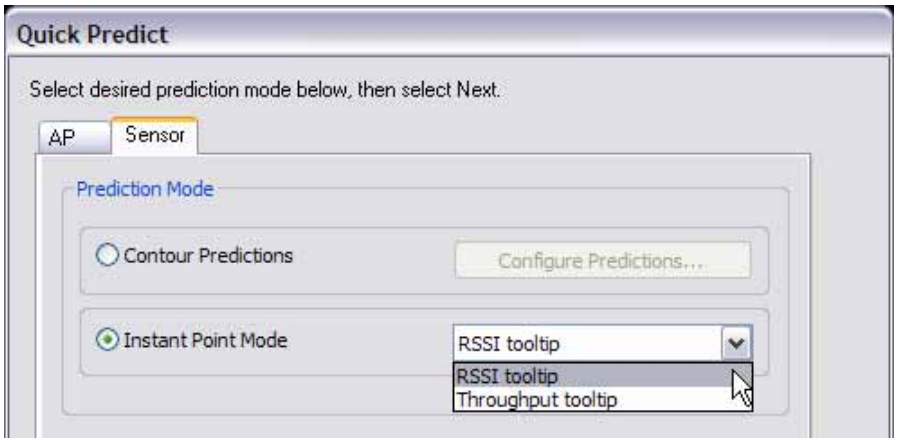


Figure 5.87: Instant Point Mode tool tip options

Keep in mind that all items mentioned above will be predicted, not just what you set as the tool tip.

A screen capture of a sample Instant Point Mode prediction is shown below:

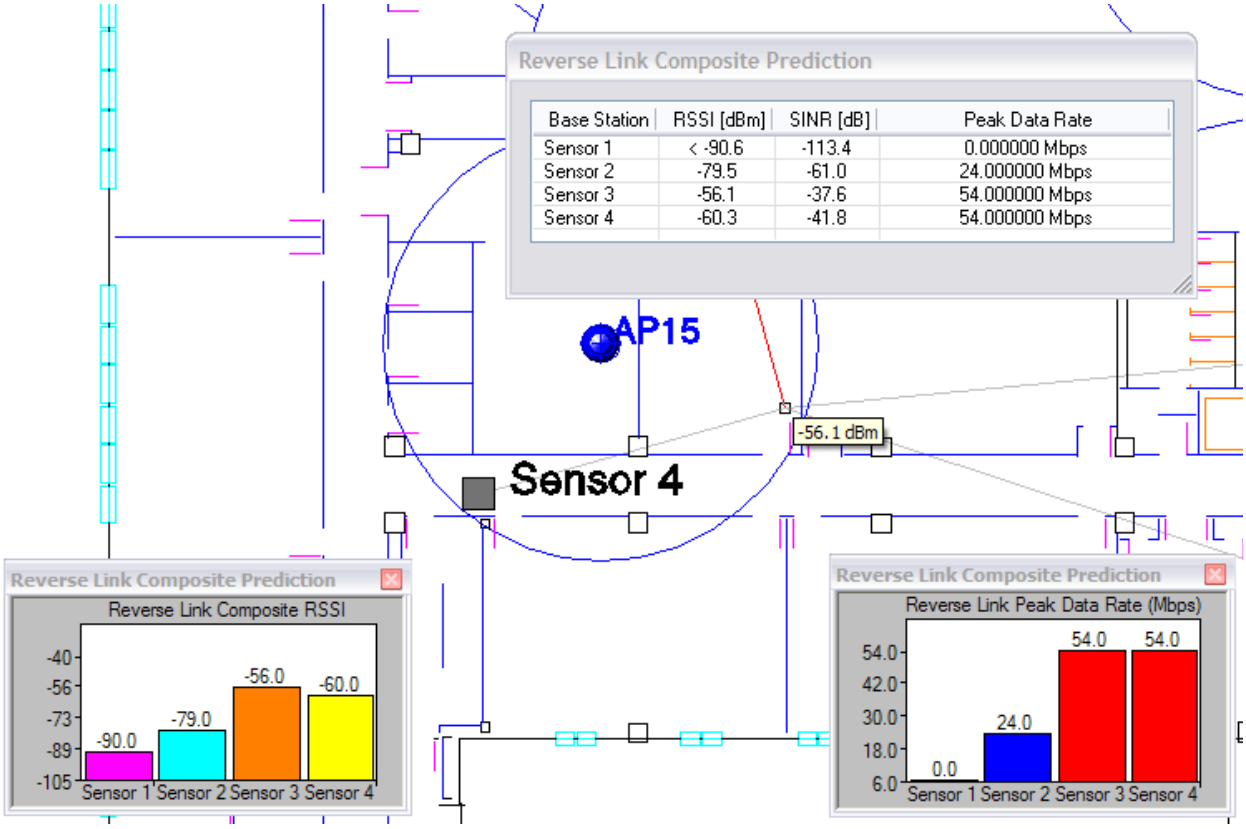


Figure 5.88: Instant Point Mode prediction with RSSI selected

If the line connecting the mobile client to a sensor is green, this indicates that the particular sensor is receiving the strongest signal from the client's current location.

Displaying Grid Coverage Results

After running a Grid Prediction (“Grid Predictions” on page 163), you can use the **Network Design > Grid Coverage Display** command to configure and view Grid Coverage statistics. Selecting Grid Coverage Display opens the **Grid Prediction Data Display** dialog (see Figure 5.90).

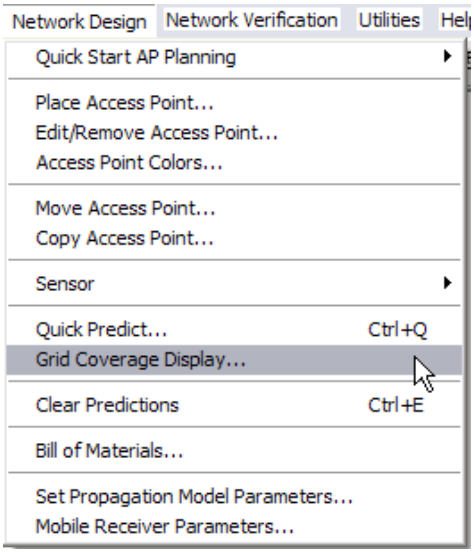


Figure 5.89: Selecting Grid Coverage Display

The **Grid Prediction Data Display** dialog below enables you to control the format and appearance of the displayed results. Grid coverage results are stored under the **RF_Design** subdirectory of your current workspace directory. The results are written to binary data files with a .cpm extension. Each .cpm file fully describes the results from a single grid coverage prediction and may be individually loaded, unloaded and displayed from any LANPlanner Solo drawing.

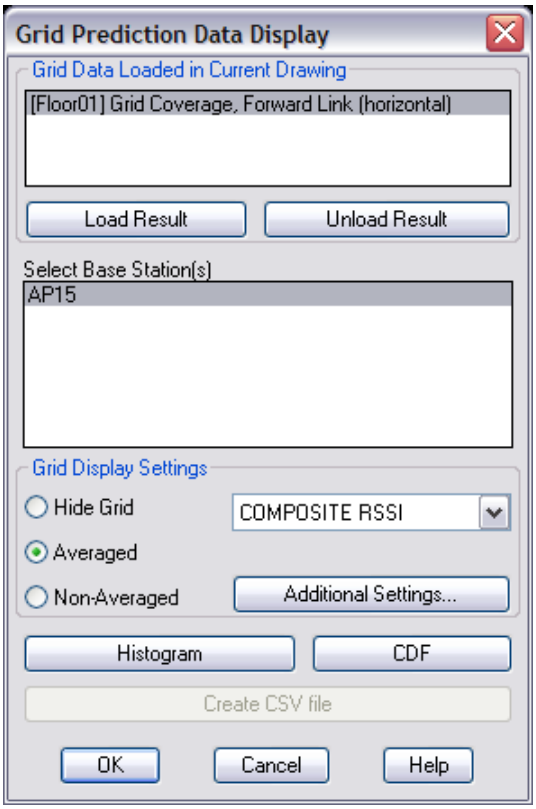


Figure 5.90: Grid Prediction Data Display dialog

The **Grid Prediction Data Display** dialog contains several user-configurable parameters:

- **Grid Data Loaded in Current Drawing** - Lists all grid coverage results that are currently loaded in the drawing. The label appearing in the list corresponds to the descriptive name given to the prediction in the dialog box and can be used to distinguish between predicted results.
- **Load Result** - Selecting this button opens dialog box enabling you to select a .cpm files from a prior grid prediction task.
- **Unload Result** - Selecting this button removes the currently displayed predicted results from the drawing. Note that the results can be viewed again by using **Load Result**.

Each loaded grid coverage result may be independently displayed or hidden. To display a grid coverage file, select the **Averaged** radio button. To hide a grid coverage result that is loaded in the current file, choose **Hide Grid** radio button. No grid coverage results are displayed unless otherwise specified.

NOTE

*All configuration options (Hide Grid/Averaged/Non-Averaged, Additional Settings, etc) are particular to the current grid data selected in the **Grid Prediction Data Display** dialog.*

The **Select Base Station(s)** list in the center of the dialog box enables you to individually select one or more access points to be included in the prediction. If an access point is excluded from the selection set in this window, its corresponding predicted results will not be incorporated into the Grid Prediction display.

The drop-down list under **Grid Display Settings** enables you to control how the predicted results are displayed:

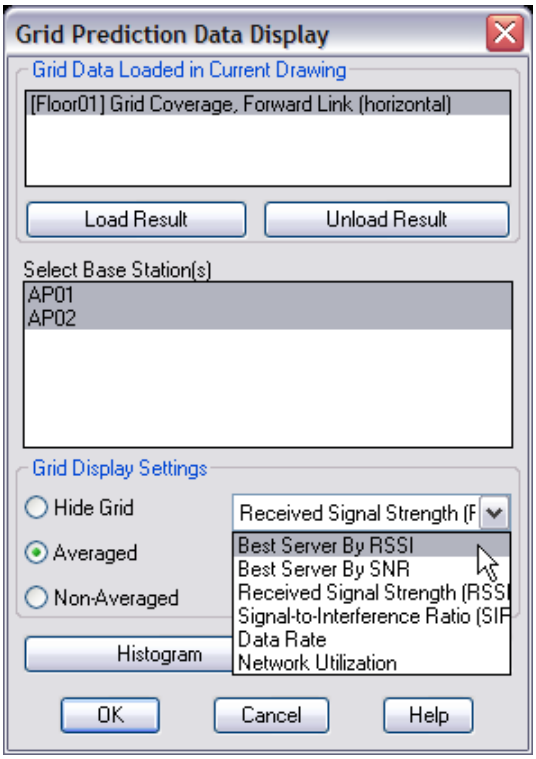


Figure 5.91: Data Display Type drop-down list

The **Grid Display Settings** drop-down menu options include:

- **Best Server by RSSI** - The best (strongest) serving access point judged by predicted received power is calculated and displayed for each grid bin.
- **Best Server by SNR** - The best (strongest) serving access point judged by predicted SNR is calculated and displayed for each grid bin.
- **Received Signal Strength (RSSI)** - Displays the RSSI for only the best server at each grid bin.
- **Signal to Interference Ratio (SIR)** - Displays the SIR for only the best server at each grid bin.
- **Data Rate** - Displays the data rate at each grid bin. The highest data rate from all transmitters is the displayed value.
- **Network Utilization** - Displays the percentage of network utilization for the best serving access point at each grid bin. These AP loads are determined by the throughput regions defined in the drawing (see “Specifying Requirement Regions” on page 111).

Displaying the Best Server by RSSI Coverage Grid

When **Best Server by RSSI** is selected from the **Grid Display Settings** drop-down list, the strongest serving access point (on the basis of composite RSSI) displays.

To configure the **Best Server by RSSI**, select the **Additional Settings** button in the **Grid Prediction Data Display** dialog box. The Configure Best Server Display dialog opens:

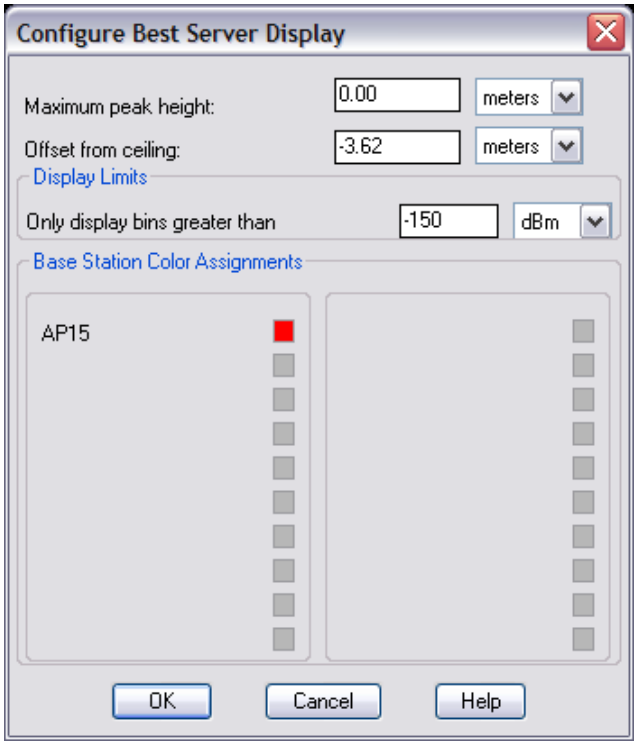


Figure 5.92: Configure Best Server Display

The **Configure Best Server Display** dialog contains the following options:

- **Maximum Peak Height** - Range of elevations (from 0 to the value entered) to use for the display. A larger predicted RSSI will result in displayed elevation at that point being higher. To flatten the 3D grid, set this value to 0.
- **Offset From Ceiling** - Specifies how far above the ceiling of the displayed floor the grid coverage results should appear to float. By specifying a negative number, the displayed grid will begin to directly overlap the building structure, which can be useful during report preparation.
- You may assign unique colors to the access points in order to distinguish one from another. To do so, simply click on the colored square to the right of the access point name and select a new color from the dialog box that appears. These colors will then be used to color the displayed grid, identifying the selected access point that has the strongest RSSI in a given area.

Received Signal Strength Coverage Grid

When **Received Signal Strength (RSSI)** is selected from the **Grid Display Settings** drop-down list, the power displayed is the RSSI from only the best server for each bin.

To configure this display, click the **Additional Settings** button in the **Grid Prediction Data Display** dialog box. The Grid Style dialog opens:

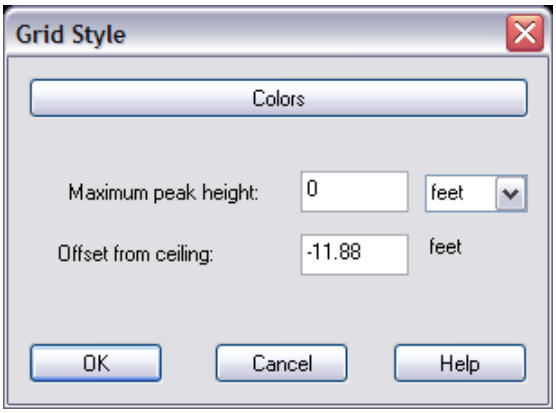


Figure 5.93: Grid Style dialog

The **Grid Style** dialog contains the following options:

- **Maximum Peak Height** - Range of elevations (from 0 to the value entered) to use for the display. Larger predicted RSSI values result in higher displayed elevation at that point. To flatten the 3D grid, set this value to 0.
- **The Offset From Ceiling** - Specifies how far above the ceiling of the displayed floor the grid coverage results should appear to float. By specifying a negative number, the displayed grid will begin to directly overlap the building structure, which can be useful during report preparation.
- **Display Limits** - Restricts the lower limit of the values displayed. For example, by entering –110 dBm into the dialog box, only those regions with a predicted RSSI of –110 dBm or higher will be displayed. The number of color categories (from two to twenty-one) and the color tint may be selected.
- **Colors** - Opens the **Color Scheme Editor** dialog box. In this dialog box you can control the mapping of signal values to a wider range of colors. The colors will be used to indicate the signal power predicted at each point in the **Received Signal Strength (RSSI) coverage** grid. Each value range in the color scheme editor can be independently edited or removed and new ranges can be added. The list of value ranges is automatically sorted

after one of the value ranges is altered, added or removed. To add a value range, click the **Add** button. To remove a value range, select a value range and click the **Remove** button.

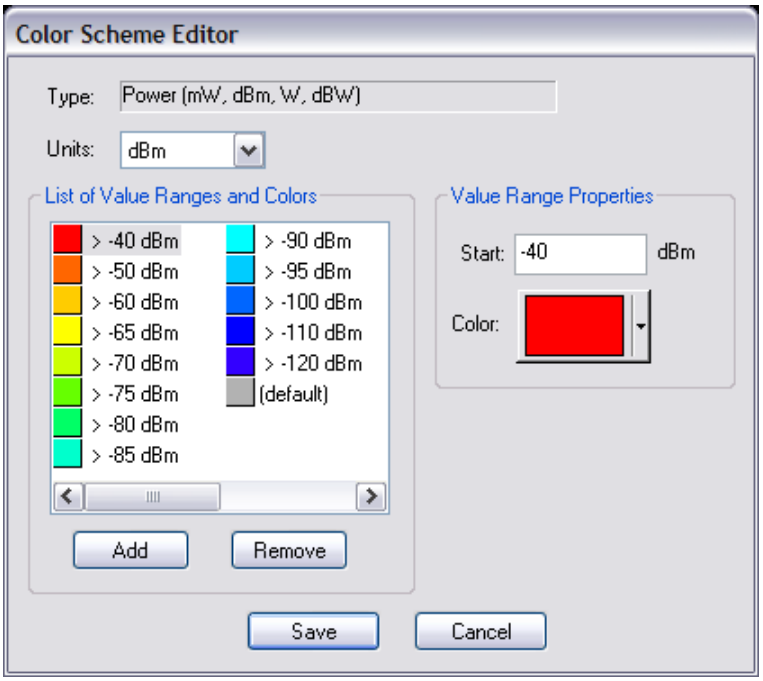


Figure 5.94: Color Scheme Editor

The right hand side of the **Color Scheme Editor** dialog box contains information that defines the **Signal Value Properties** range that has been selected in the list on the left hand side of the dialog box. The **Color** is the color that will be used to indicate signals that fall into the selected signal value range. **Start** is the lowest signal value that will be included in the selected signal value range. All signals greater than the **Start** value, but less than the starting value of the next highest range, will be included in the selected signal value range. To change the color for a value range, click on the color swatch and choose a new color. Note that changing the starting value for a signal value range will change how it sorts in the list on the left hand side of the dialog box.

There is always a default signal value range. The color white is assigned to any signal that falls below the lowest user-defined signal value range. The default signal value range cannot be removed. You can alter the default color by selecting the default value range and clicking the color swatch on the right hand side of the dialog box.

Color schemes are persistent in a drawing, so that subsequent RSSI grid predictions will retain the color scheme settings of the previous RSSI grid prediction. If no RSSI grid prediction has previously been displayed in a drawing, the software uses the settings from the last drawing in which a RSSI grid prediction was performed. If no RSSI grid prediction has been performed by a user in any other drawing, the default color scheme provided by the software installation will be used.

The **Color Scheme Editor** presents a spectrum style color setup, progressing from red hot to orange, yellow, green, blue, indigo and violet, different grades of a strong to weak signal. Another useful color scheme is a simple ‘green is good, yellow is **OK**, red is bad’ color scheme. The ‘green is good…’ color scheme is easily implemented by deleting all but two signal value ranges and the default, making the first value range green and setting its start point to the lowest good signal value, changing the second value range to yellow and altering its start point to indicate the lowest **OK** signal value and finally, changing the default signal value range to red.

Displaying the Data Rate Grid

When **Data Rate** is selected the grid will display the predicted throughput at a given point. The predicted throughput will be the highest throughput of all the transmitters that are included in the display of the grid. For transmitters that are predicting throughput based on RSSI, the RSSI value is calculated as a composite RSSI. This means that all the antennas attached to a given access point will contribute to the signal strength at any given point.

To configure the **Data Rate**, select the **Additional Settings** button in the **Grid Prediction Data Display** dialog box. The Configure Grid Display dialog opens:

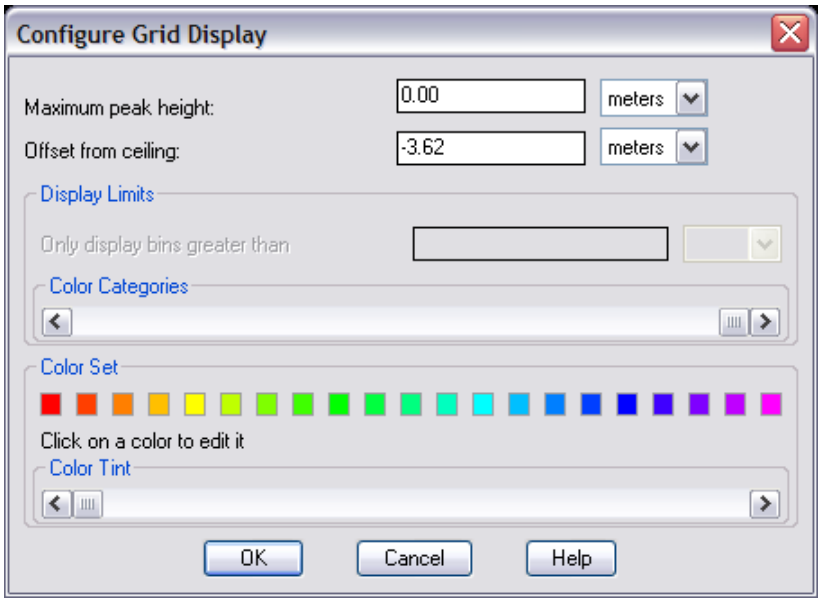


Figure 5.95: Configure Grid Display

The Configure Grid Display dialog behaves the same as configuring an RSSI grid except there is no option to omit bins of that do not have meet a throughput cutoff.

Displaying the Network Utilization View Grid

When **Network Utilization** is selected, the grid will display the utilization at the location of each grid tile. The utilization is the percentage of the total aggregate throughput limitation of the access point serving the given location that is actually being used by network clients.

For example, if APx01 is the access point that is providing the best service to a given location in the drawing, and APx01 is an 802.11g access point with 54 Mbps total aggregate throughput available, and eleven clients are connected to APx01 somewhere in the building each at 2 Mbps, then the actual aggregate throughput for APx01 is 22 Mbps or 50% of its rated maximum, so a value of 50% will be plotted at the grid bin in question.

Note that the value plotted at each grid bin of a utilization view depends on the overall status of the AP that provides the best service to the location of the grid bin. The utilization view is not based on the presence or absence of particular clients at the particular location of the grid bin. In this respect the Network Utilization plot is similar to the Best Server by RSSI plot, except that the value plotted is the utilization of the best server, not the signal power received from the best server.

When you have selected the Network Utilization grid display option, the **Additional Settings** button allows you to select the color values for each range, but the ranges will always be in 10% increments, starting at 100% e.g. 100%, 90%, 80%, etc.

To edit the grid prediction throughput regions, select **Network Design > Quick Start AP Planning > Edit Throughput Regions**. This opens the Specifying Requirement Regions dialog (see “Specifying Requirement Regions” on page 111). These throughput regions directly affect how the Network Utilization view calculates network utilization.

NOTE

If no throughput regions are defined, the following error message displays: ***Could not compute AP loads***

Histogram

The **Histogram** button provides a quick view of the distribution of the predicted results relative to the percentage of floor area occupied by the grid. The percentage of the floor area covered is shown in terms of percentages along the vertical axis. In addition, the total number of calculated points (or bins) is given in the lower left corner.

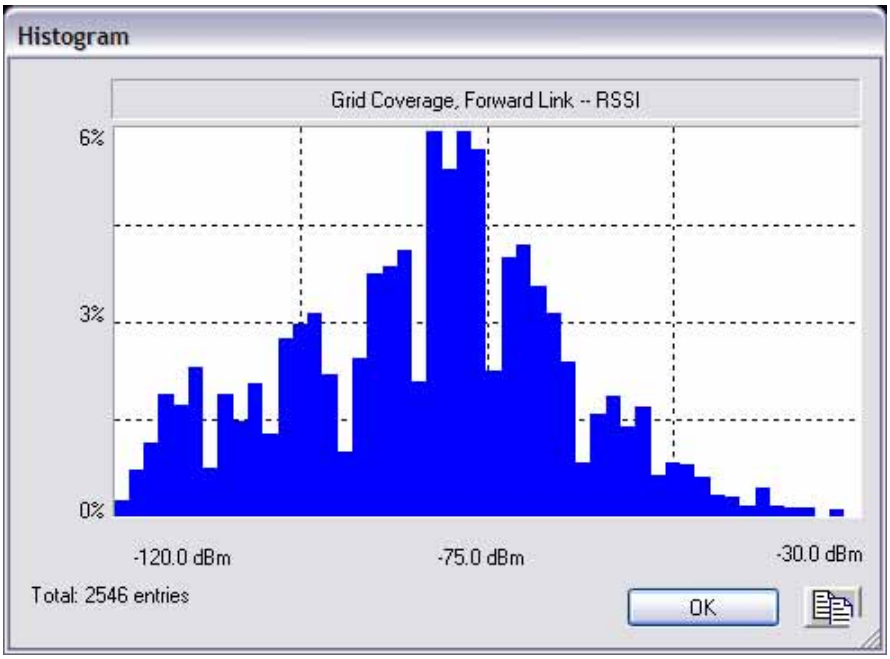


Figure 5.96: Histogram window

CDF display

The **CDF display** button provides a quick view of the cumulative distribution function (CDF) of the predicted results relative to the percentage of floor area. For a given power value, the percentage on the vertical axis is the percentage of the grid which sees a power greater than or equal to the selected power. In addition, the total number of calculated points (or bins) is given in the lower left corner.

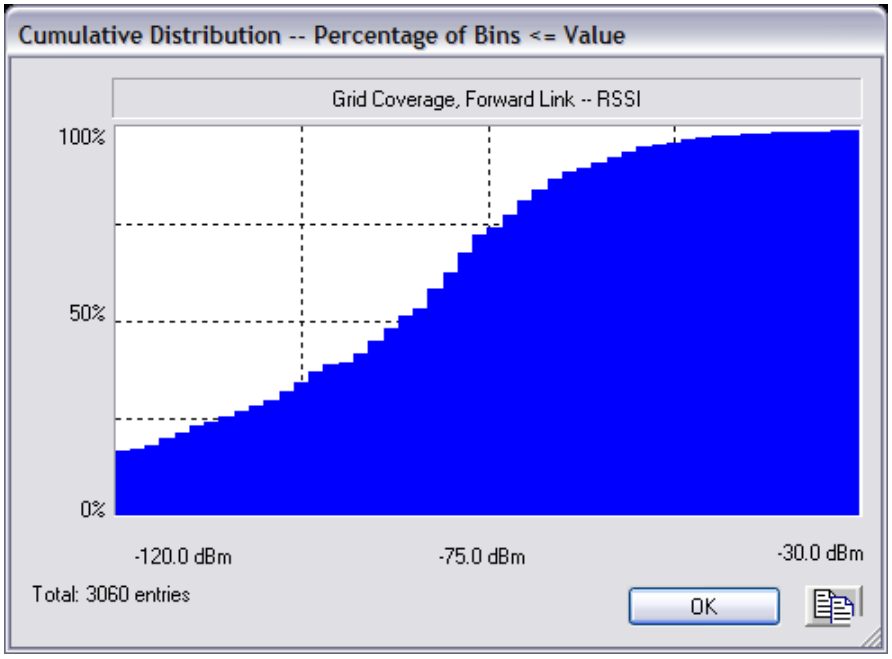


Figure 5.97: Cumulative Distribution Function window

Generating a Bill of Materials

The **Network Design > Bill of Materials** command launches a dialog with a scrollable list box that contains information about the materials that exist in the current drawing. This list shows the quantity, cost, and what equipment is required to deploy the wireless network system.

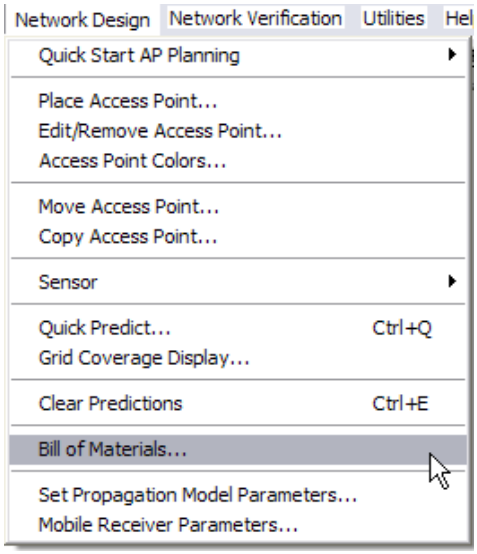


Figure 5.98: Selecting Bill of Materials

An example bill of materials is shown below:

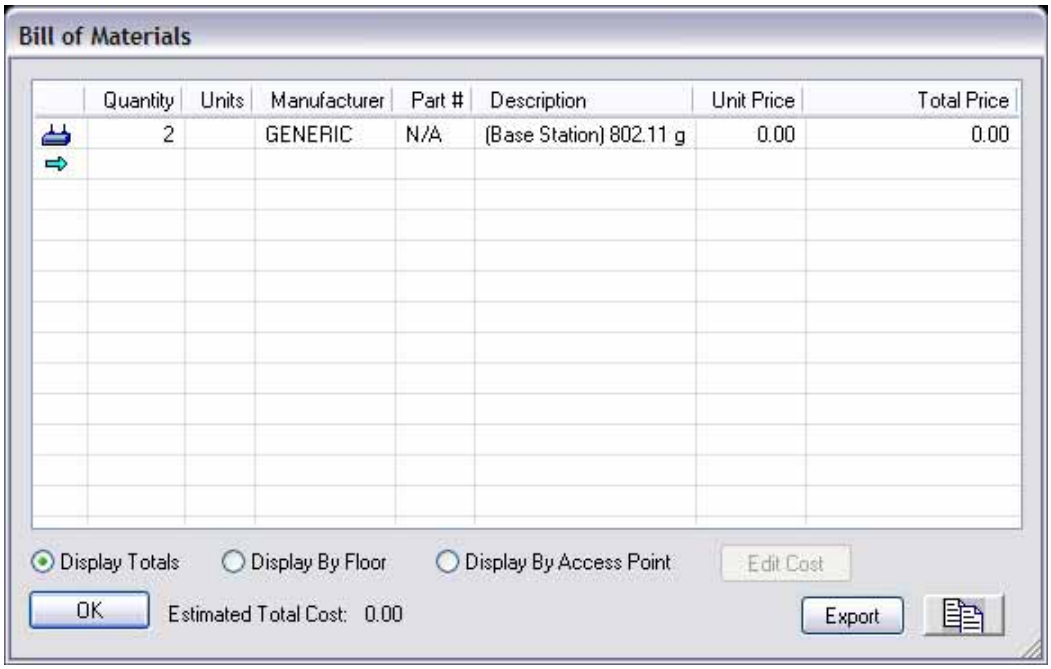


Figure 5.99: Bill of Materials dialog

Setting Propagation Model Parameters

Selecting **Network Design > Set Propagation Model Parameters** menu command launches the **Set Propagation Parameters** dialog shown in Figure 5.101.

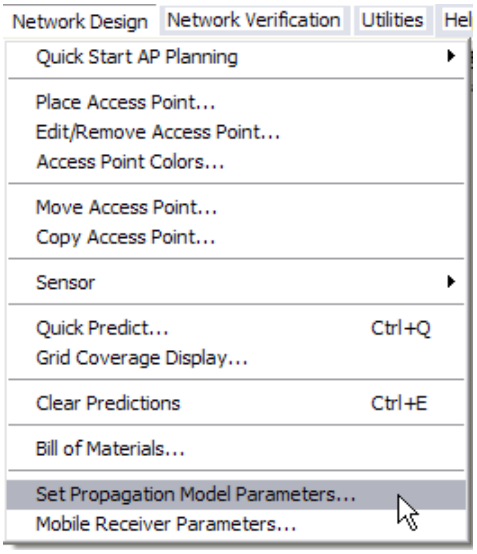


Figure 5.100: Selecting Set Propagation Model Parameters dialog

The Set Propagation Parameters **Floors** tab below allows you to set floor attenuation factors for use by LANPlanner Solo's predictive engine. To change an attenuation loss for the various floor separations, click on the attenuation value you wish to change. The value will become editable, and you may simply type in a new value. Each value determines the attenuation applied to a signal as it passes through the specified number of floors.

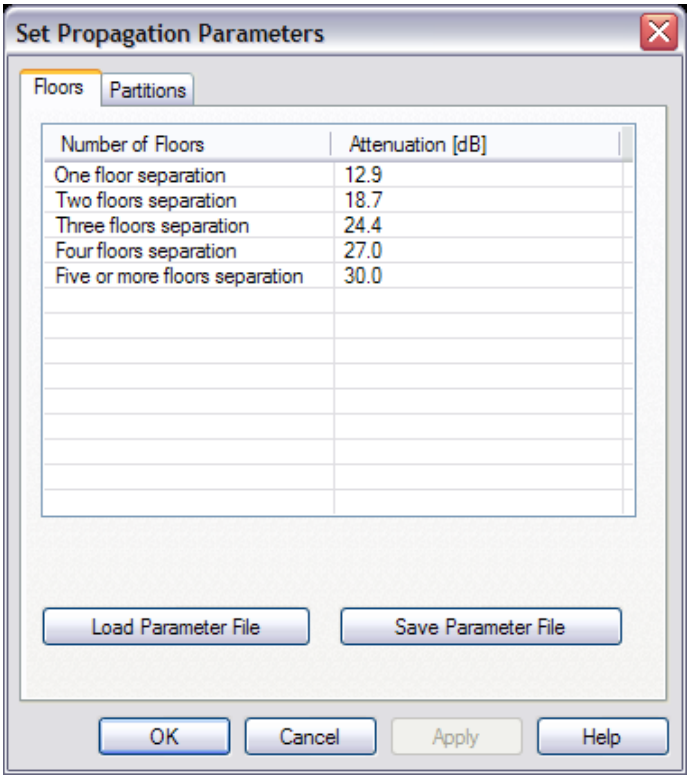


Figure 5.101: Set Propagation Parameters - Floors tab

The **Partitions** tab below allows you to modify the attenuation values of the partitions in the drawing. This should be used to edit the partitions in the current drawing. To modify the attenuation value of a partition, select it from the list and then press the **Edit** button. To change the categories in the current drawing or edit the global library, refer to the associated **Format Building** commands: **Current Partition Categories**/**Edit Partition Library**.

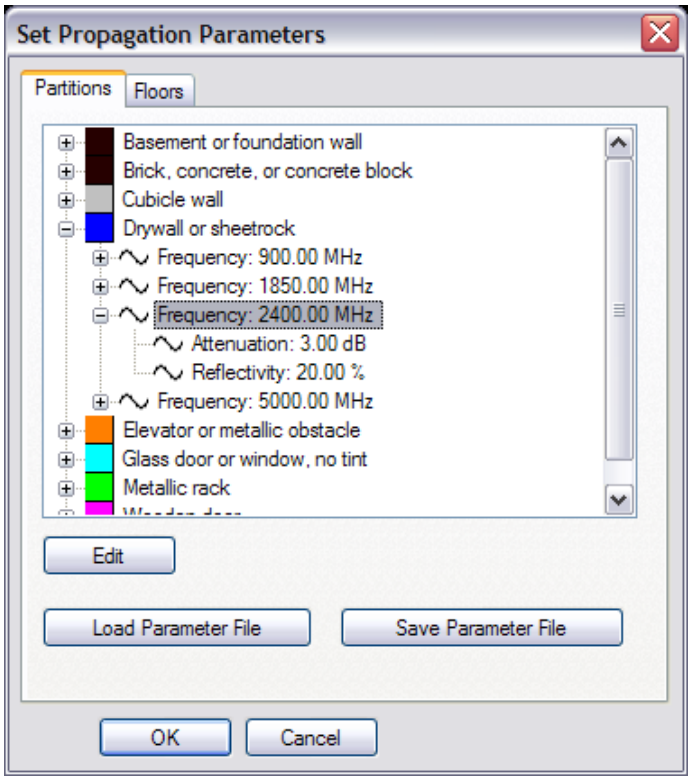


Figure 5.102: Set Propagation Parameters - Partitions tab

- **Load Parameter File** - Select to import a pre-existing parameter file. Opens the dialog below:

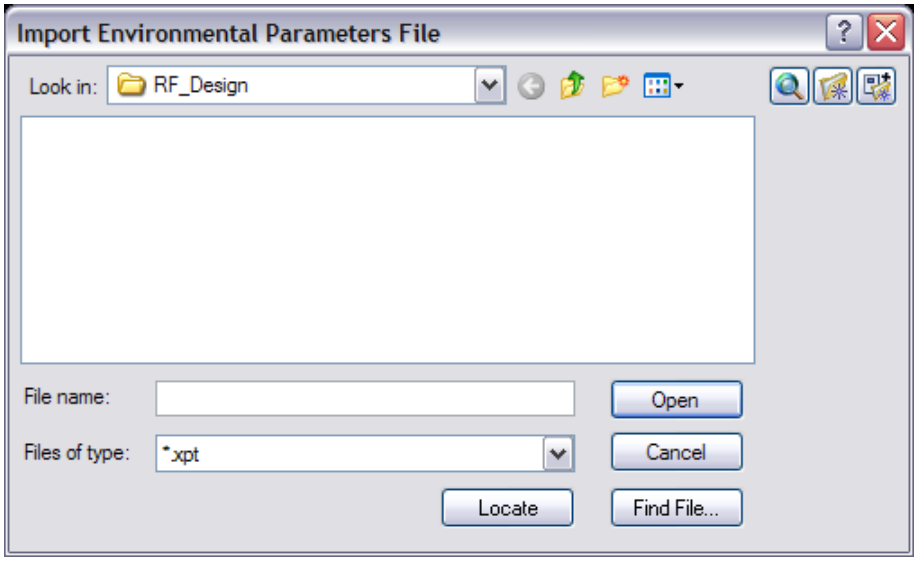


Figure 5.103: Import Environmental Parameters File dialog

- **Export Parameter File** - Select to export a parameter file for future prediction tasks. Opens the dialog below:

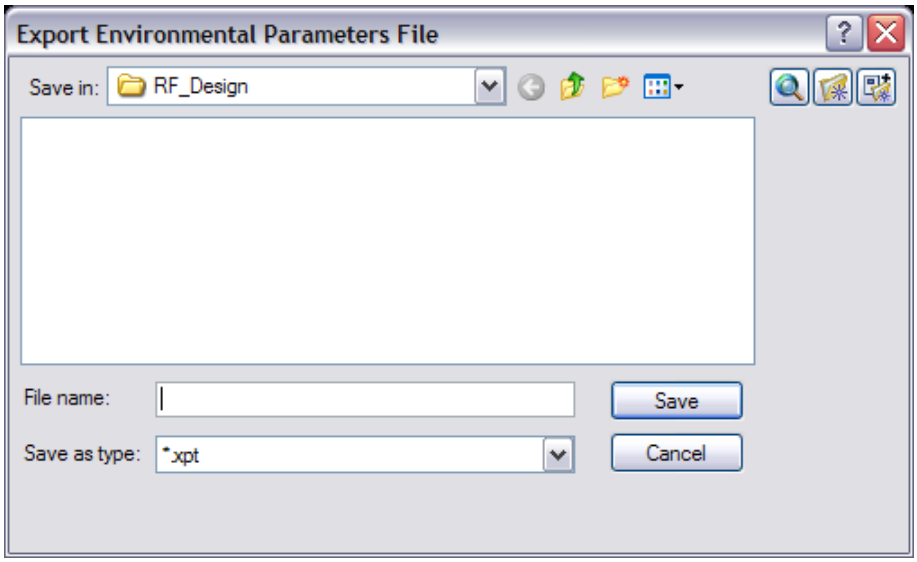


Figure 5.104: Export Environmental Parameters File dialog

Setting Mobile Receiver Parameters

Mobile receiver parameter settings directly impact both forward and reverse link predictions. The diagram below shows a typical example of a forward link prediction. When LANPlanner Solo runs coverage predictions, the resulting plot displays the power at each location (in the grid or contour) as if a mobile client were located there, and the power was **from the access point as seen by the mobile client at that location.**

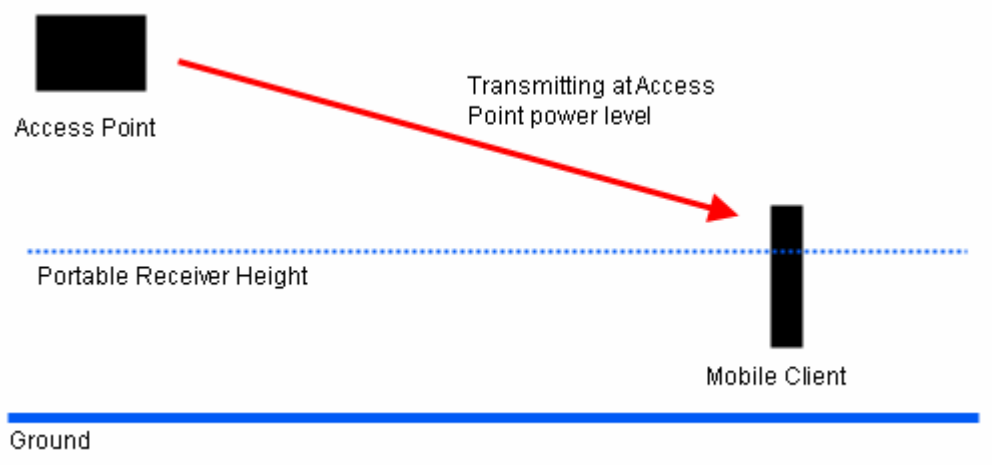


Figure 5.105: Forward Link Prediction

Below is an example of a reverse link prediction. When LANPlanner Solo runs coverage predictions, the resulting plot displays the power at each location (in the grid or contour) as if a mobile client were located there, and the power was seen by the access point from that location

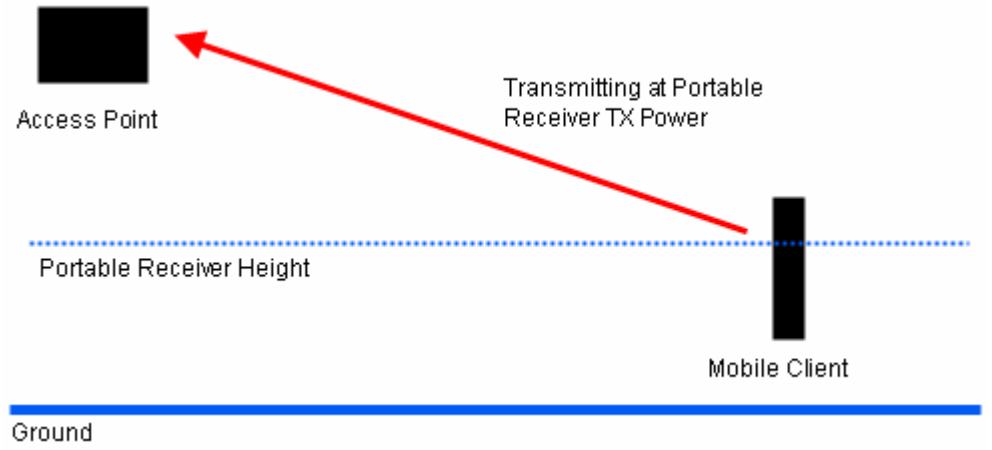


Figure 5.106: Reverse Link Prediction

Selecting **Network Design > Mobile Receiver Parameters** allows you to change settings that directly effect forward and reverse link predictions as described above.

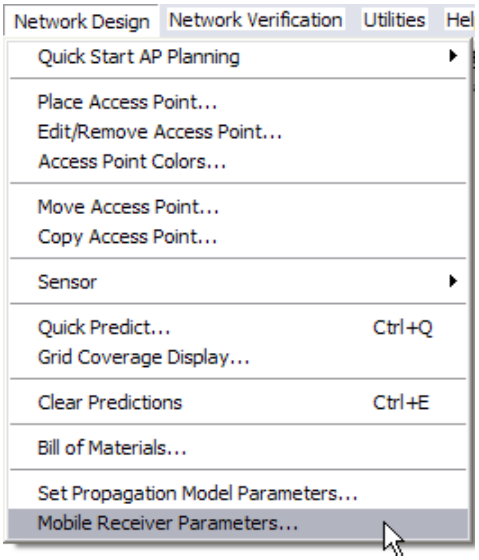


Figure 5.107: Selecting Mobile Receiver Parameters

Mobile Receiver Parameters are configured in the dialog below:

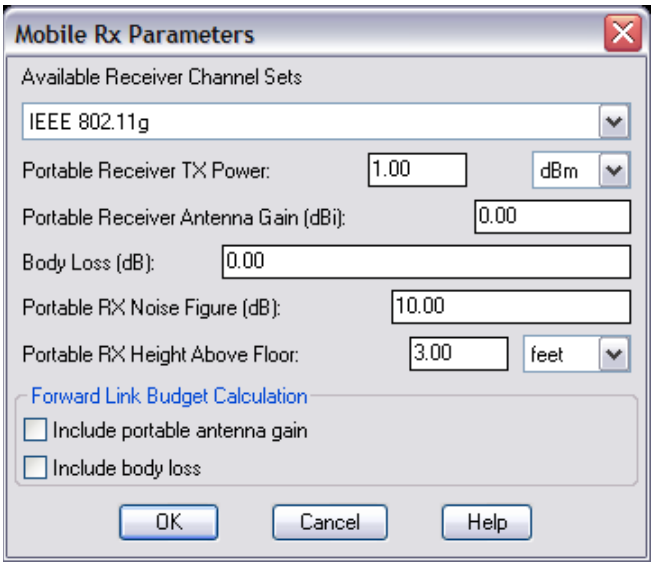


Figure 5.108: Mobile Receiver Parameters dialog

The **Mobile Rx Parameters** dialog includes the following options:

- **Available Receiver Channel Sets -** This drop down list allows you to select any of the Air Interface Standard, which are available from access points in the drawing. A mobile receiver can support more than one, depending on the access points placed in the current drawing.

- **Portable Receiver TX Power** - Transmit power of the mobile client. This is similar to the transmit power of an access point, but this value gets used in reverse link predictions. This is especially important for sensor predictions, as the client transmit power directly affects the sensor coverage area.
- **Portable Receiver Antenna Gain** - Amount of gain added by the antenna of the portable receiver.
- **Body Loss** - User-configurable setting which adds loss (in dB) to a reverse link prediction.
- **Portable RX Height Above Floor** - This is the simulated height of the mobile receiver. It is also the height above the floor at which forward link predictions are performed.

6 Network Verification

Introduction

This chapter describes the process of collecting measurement data with LANPlanner Solo for the purpose of verifying system performance and optimizing your building model. This process occurs after wireless network design deployment (access points/sensors placed, connectivity verified).

Verifying Wireless Network Coverage

LANPlanner Solo eliminates the hassles involved in measurement data acquisition for wireless networks design by implementing a point-and-click method of acquiring measurement data from your PC's wireless LAN (WLAN) card.

LANPlanner Solo leverages its internal drawing files, which provides a site-specific means of recording measurement information. The process of acquiring measurement data is reduced to simply setting your PC to associate with an access point in the building, placing the same access point within the LANPlanner Solo drawing, and then roaming throughout the LANPlanner Solo drawing environment. Each time you identify your location by clicking on the associated position on the drawing, measurement data from the WLAN card is recorded, logged, and embedded directly in the drawing. This track mode capability allows you to click a start and end point, then records data as you walk, making it unnecessary to click for each measurement point.

LANPlanner Solo requires a working wireless LAN card for recording measurement data. Collecting measurement data in LANPlanner Solo may be done in either of two configurations:

- Stand-alone measurements (see "Stand-alone Measurements" on page 192)
- Server-coupled measurements (see "Server-coupled Measurements" on page 196)

Stand-alone Measurements

You can use LANPlanner Solo to record measurement data and annotate the data directly to the building drawing files. This process requires that LANPlanner Solo be installed on a mobile computer such as a laptop or pen-tablet, and that the mobile computer be equipped with a compatible wireless LAN card. LANPlanner Solo's **Network Verification** menu contains the capabilities to measure RSSI, noise levels, and data rate from compatible cards. To record measurement data in stand-alone mode, select **Network Verification > Record Measurements:**

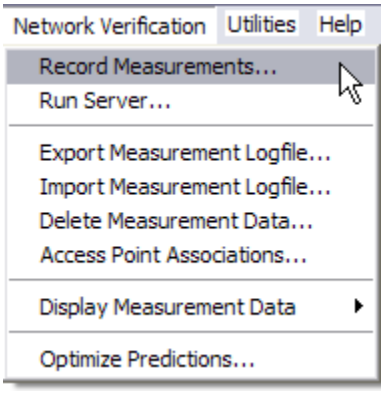


Figure 6.1: Selecting Record Measurements

The **Record Measurements** command launches the **Select WLAN Adapter** dialog below. Before you can record measurements, you must provide LANPlanner Solo a valid WLAN adapter:

Figure 6.2: Selecting a WLAN adapter

After you have chosen a WLAN adapter, the **Measurement Collection Client** dialog opens. This dialog allows you to record and save measurements while your mobile computer is operating in stand-alone mode.

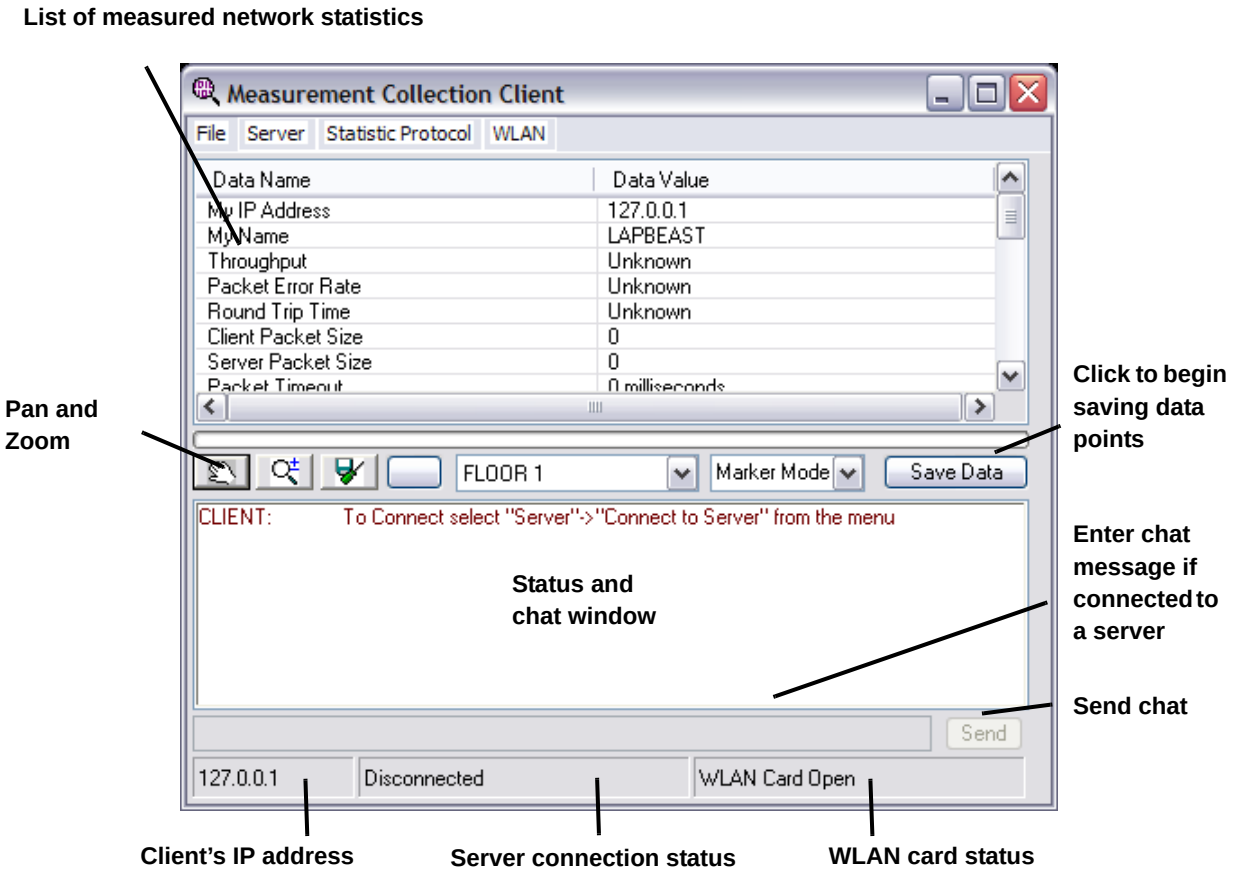


Figure 6.3: Measurement Collection Client dialog

Saving a Data Point

LANPlanner Solo utilizes a site-specific model of the measurement environment to associate measurements with a location based upon a 3D X, Y, Z-based coordinate system.

To associate a measurement with a location, you will simply need to click the location in the model where the measurement is being made. The X, Y, Z coordinate is then identified from the mouse click and associated and stored in the drawing database.

To record a measurement point, use the **Save Data** button (shown in Figure 6.3). When you click the save data button, you can begin saving data points, but recording does not start until you actually start clicking in the drawing. This stores the results that were displayed as well as the location of the measurement marker. You can continue clicking and saving data points. When finished, right-click or press **ESC** to return to the Measurement Collection Client. You can continue taking measurements by clicking Save Data again, or finish the current run by pressing the "X" in the upper right corner or by using the menu command **File > Exit**.

If your drawing contains access points, you will be prompted to **Associate** your measurement data with an access point (see Figure 6.4). Associating with an access point is necessary if you choose to optimize your drawing. LANPlanner Solo must know which access point you were connected to when taking measurements so that it can accurately compare measured values to the prediction from the correct access point in the drawing. After taking measurements and exiting the Associate dialog, your measurement run is automatically saved in the drawing file.

LANPlanner Solo records the IP address, SSID, and MAC address of the access point for each measurement. This is useful if you happen to roam between access points when taking measurements since you can associate measurement points within a single measurement run to multiple access points in the drawing.

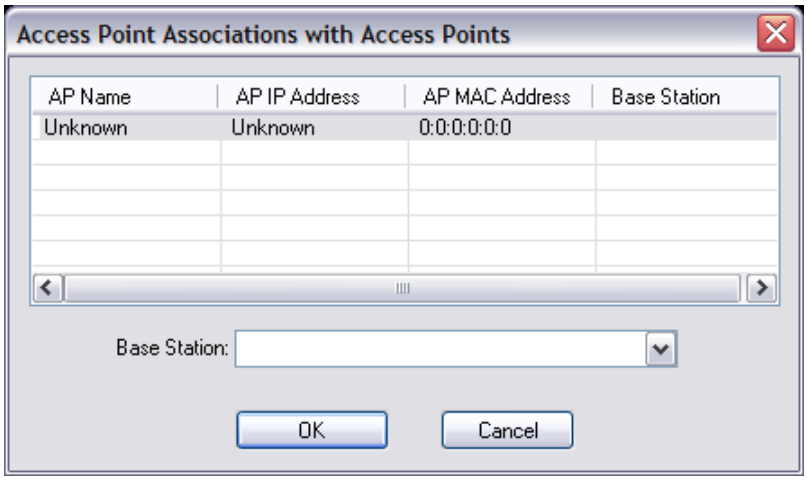


Figure 6.4: Access Point Association

NOTE

When you exit the Associate dialog and the measurement run gets saved in the drawing, it is also saved as an ASCII logfile in .wvc format in the measured folder of your current project workspace folder.

The example below shows a screenshot of a standalone measurement session:

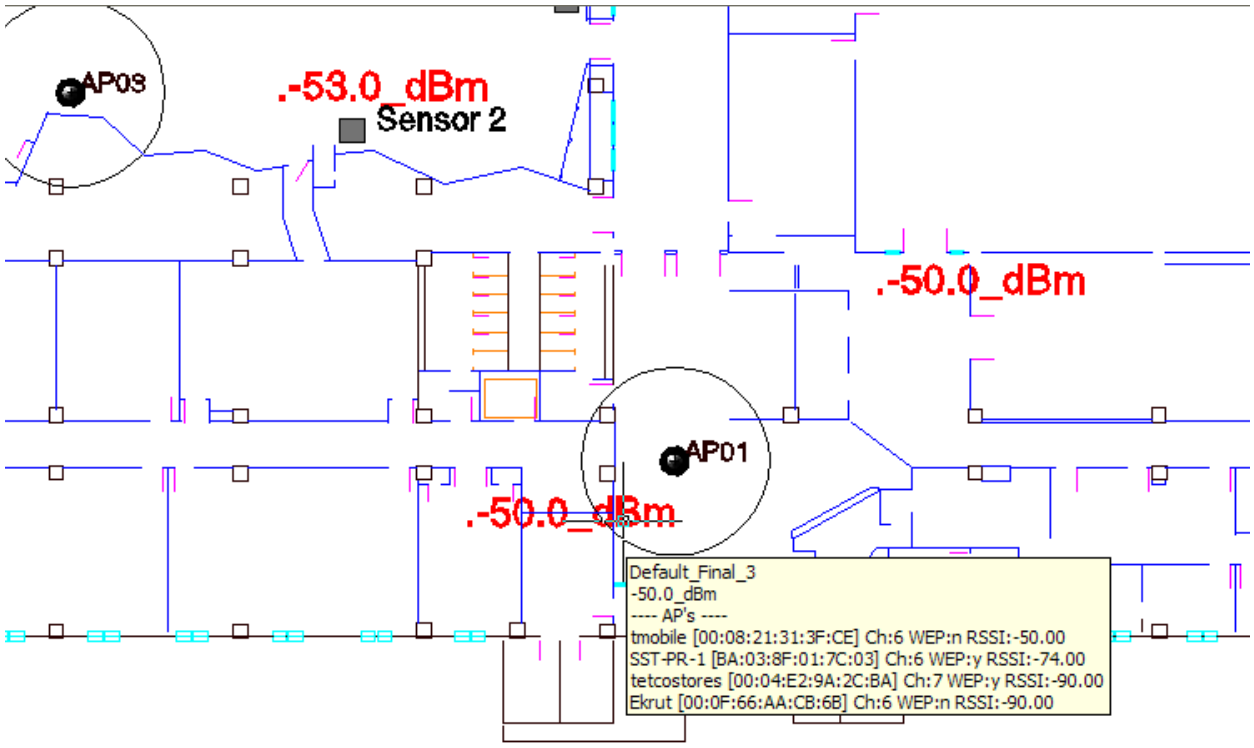


Figure 6.5: Standalone measurement session

Server-coupled Measurements

LANPlanner Solo may also be configured to connect to a measurement server to collect measurement data. This configuration requires two copies of the software to be running on portable computers - one copy to run the server functionality and one copy to use for measurements. The ‘server’ is functionality is built-in to LANPlanner Solo. This functionality generates network traffic that allows the user to capture network-level data such as data rate, packet latency, and retry rates in addition to RSSI and noise.

Starting a Server

To start a server, choose the menu command **Network Verification > Run Server**:

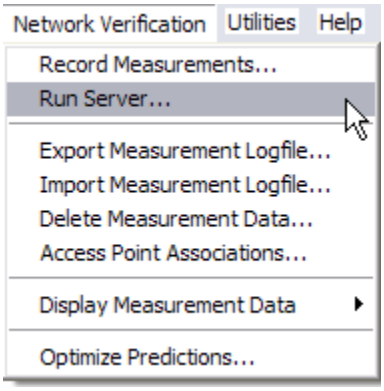


Figure 6.6: Selecting Run Server

A dialog box prompts for the server port number:

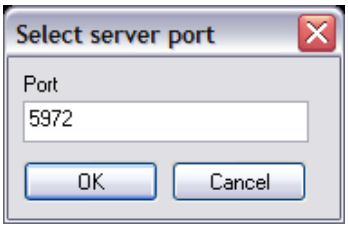


Figure 6.7: Entering a server port

After choosing a port, the **Measurement Server** window opens:

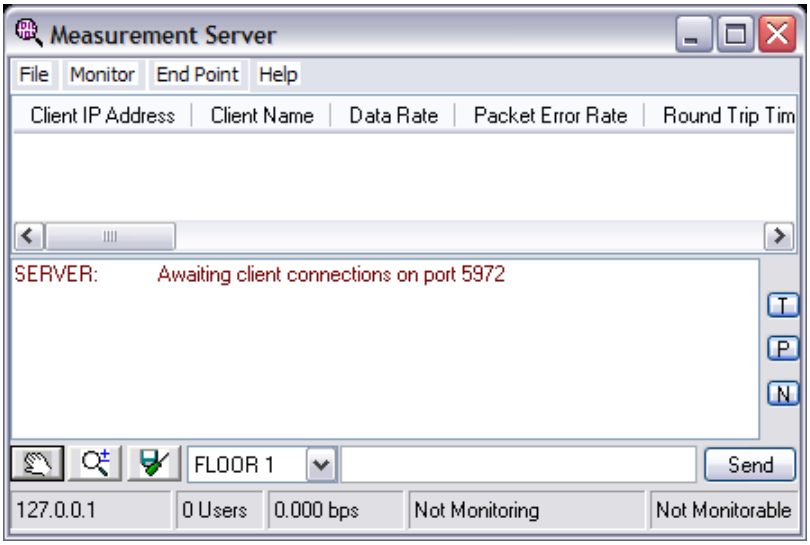


Figure 6.8: Measurement Server dialog

NOTE

Note that the server displays the computer's IP address in the lower left corner of its screen. You will need this address to connect your client to your server. Once the server is running, you can leave it unattended while you begin your measurement survey.

If you are not running in standalone mode, there are two ways to connect to a server:

- **Using a client to connect to the server** - From the client, select **Server > Connect to Server**, and enter the IP address of the server to connect to. This opens the **Connect To Server** dialog box shown in Figure 6.9.
- **Using a server to connect to a client** - From the server, choose the menu option **End Point > Connect** to bring up the **Connect To Endpoint** dialog box shown in Figure 6.10.

NOTE

A server connection is not required to use the measurement client. The server connection generates network traffic to enable the user to retrieve statistics such as application level throughput, packet latency, and retry rates. Without a server connection, the user can still measure RSSI, noise, and data rate. Many users choose not to setup a measurement server to simplify their measurement tasks.

NOTE

It is important that you do not have a software firewall on either computer blocking the client-server connection.

Figure 6.9: Connect to Server dialog (from client)

Enter the IP address of the server you wish to connect to and the port that the server is running on, then click **Connect**. Servers that you have recently connected to will be remembered. In future runs, you can reconnect to a server, by choosing one from the history list on the Connect to Server dialog.

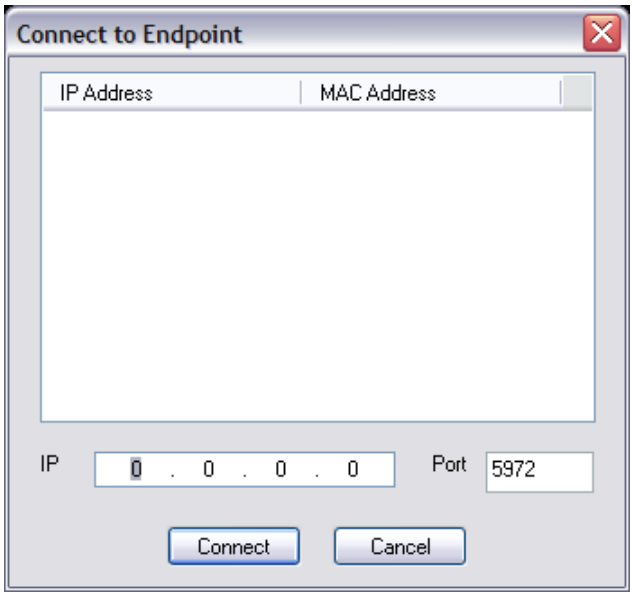


Figure 6.10: Connect to Endpoint dialog (from server)

After you are connected, click save data to record measurements. Now you have access to network data that the server generates in addition to the RSSI, noise, and data rate measurement that are available in stand-alone mode.

Using the Chat Facility

LANPlanner Solo has a chat facility that allows you to send messages to the server and other LANPlanner Solo clients. To use this facility yo must be connected to a server. Then, type your message into the **Chat** field (Figure 6.3) and press the Send button. A copy of the message will be displayed in the status window of the Measurement Server dialog along with the IP address of the sender.

Exporting Measurement Logfiles

After you have collected measurement data, you can export measurement data for a select measurement run into an ASCII log file by using the **Network Verification > Export Measurement Logfile** command. After each measurement run, the measurement data is automatically stored in the drawing file itself.

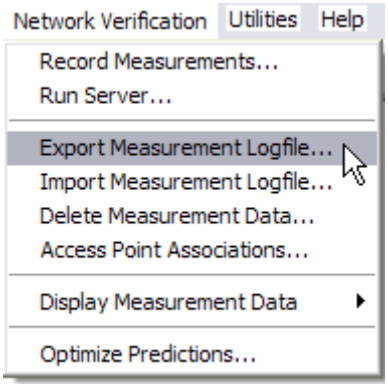


Figure 6.11: Selecting Export Measurement Logfile

Selecting **Export Measurement Logfile** opens the dialog below, which enables you to select the measurement you wish to export and the location and name of the logfile:

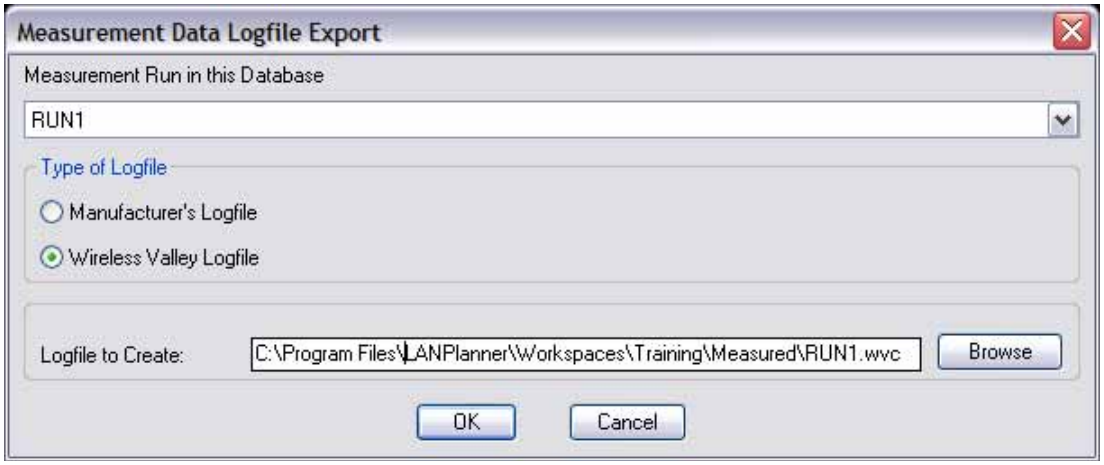


Figure 6.12: Exporting measurement data to an ASCII logfile

Use the **Browse** button to choose the destination of the ASCII measurement file, and then select **OK** to export the file.

Importing Measurement Logfiles

If you have measurement data from prior sessions, use the **Network Verification > Import Measurement Logfile** command to import a LANPlanner Solo ASCII measurement logfile, or other formats from specific measurement receivers, and embed the data directly within the building drawing.

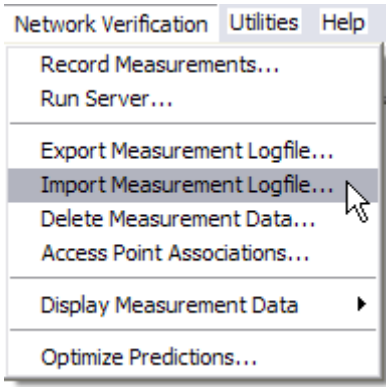


Figure 6.13: Selecting Import Measurement Logfile

Selecting **Import Measurement Logfile** opens the dialog below (Figure 6.14), which enables you to select the type of measurement from the **Select Type of Logfile to Import** drop-down, and the location and name of the logfile:

Figure 6.14: Measurement Data Logfile Import dialog

After selecting the type of logfile to import, use the **Browse** button to find the location of the ASCII measurement file, and then select **OK** to import the file.

Deleting Measurement Data

Use the **Network Verification > Delete Measurement Data** command to remove measurement data from the current drawing database.

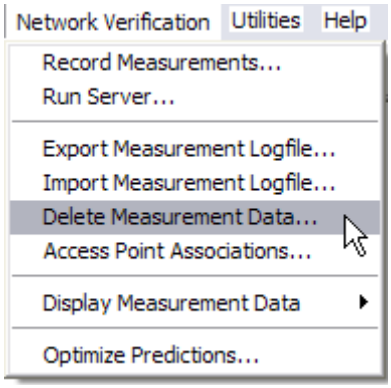


Figure 6.15: Selecting Delete Measurement Data

The **Measurement Run Delete** dialog opens:

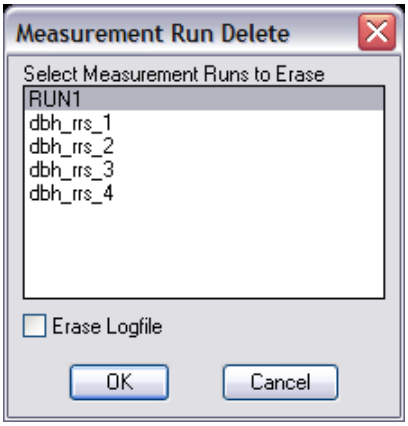


Figure 6.16: Deleting measurement data from a drawing

Select the measurement run from the list that you want to remove from the drawing. Next, press **OK** to have the measurement data erased from the drawing. If you previously stored an ASCII measurement logfile (this logfile is written automatically when you collect the data), deleting it from the drawing will NOT erase the ASCII logfile.

If you wish to also have the ASCII logfile erased, check the **Erase Logfile** box before deleting the logfile data from the drawing. Measurement data logfiles, by default, are stored in a subdirectory called Measured under the active project workspace directory. See “Workspace Directory Structure” on page 58.

Displaying Measurement Data

After recording measurements, you can display or hide both text and graphical markers on the building drawing by using the **Network Verification > Display Measurement Data** command.

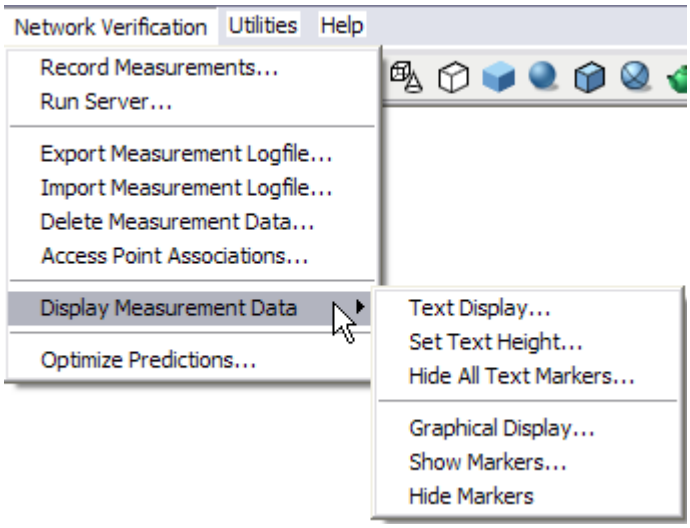


Figure 6.17: Display Measurement data submenu

Text Display

To display measurement data as text in the drawing, click **Network Verification > Display Measurement Data > Text Display**. This option will display the dialog shown in Figure 6.18, below. Choose the measurement run you wish to display form the drop-down box and click **Next**.

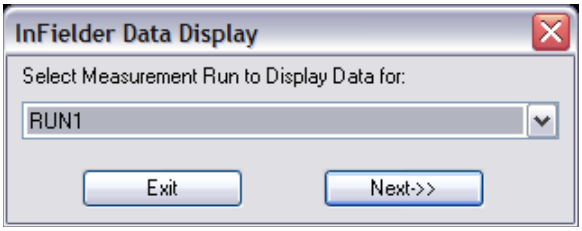


Figure 6.18: Text Display dialog box

Set Text Height

To control the height of text markers, click **Network Verification > Display Measurement Data > Set Text Height**. This will modify the size of the measurement data text in the drawing. This value can be set in feet or meters.

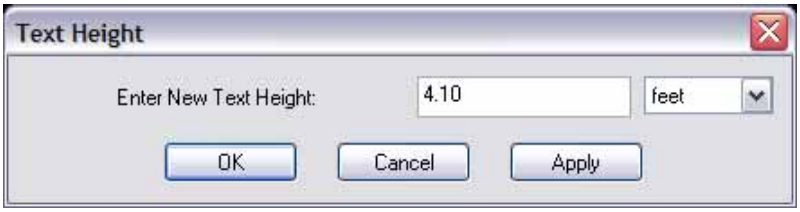


Figure 6.19: Text Height dialog

Hide All Text Markers

To hide the display of all measurement text in the drawing, click **Network Verification > Display Measurement Data > Hide All Text Markers**.

Graphical Display

LANPlanner Solo can also display measurement data as graphical markers in the drawing. These markers indicate measured values using both color and height. To configure graphical markers, click **Network Verification > Display Measurement Data > Graphical Display**.

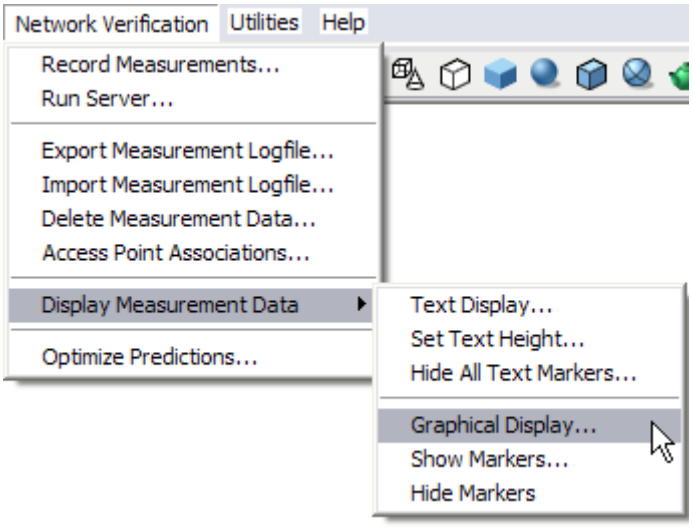


Figure 6.20: Selecting Graphical Display

The **Graphical Measurement Display** dialog opens:

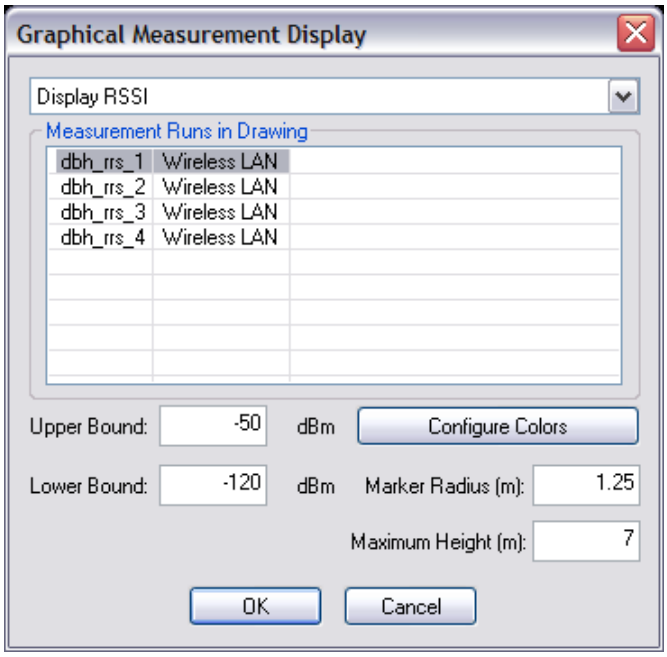


Figure 6.21: Graphical Measurement Display dialog

From the **Graphical Measurement Display** dialog, you can select the measurement data you wish to display. Select one or more measurement runs from the list and choose the data value you would like to display from the pull down list. There are many options for the pull down data display, but not all of them will apply to your measurement data. If you select measurement information that is not included in your measurement runs, nothing will be displayed in the drawing.

The **Marker Radius** enables you to control the size of each marker point. The marker radius is specified in meters (relative to scale of the drawing). The **Upper** and **Lower** bounds indicate the range of data you wish to display. This range is used to determine the assigned marker colors. Selecting **Configure Colors** displays the **Graphical Data Color Setup** dialog:.

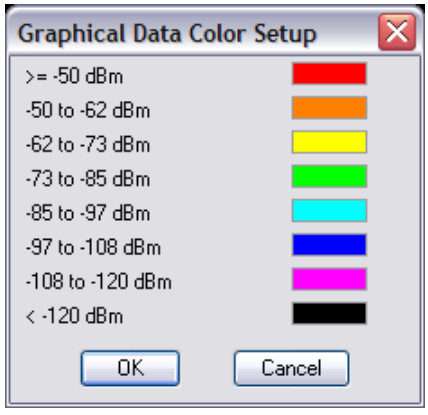


Figure 6.22: Assigning colors for graphical display of measurement data

The range of values between the upper and lower bounds is divided into eight intervals. You may specify a unique color for each interval by clicking on the color next to a range. During display, the interval into which the value of each measurement data point falls is identified, and the corresponding color is used for the marker placed at the location.

The example below shows a screenshot of a measurement session with Graphical Markers enabled:

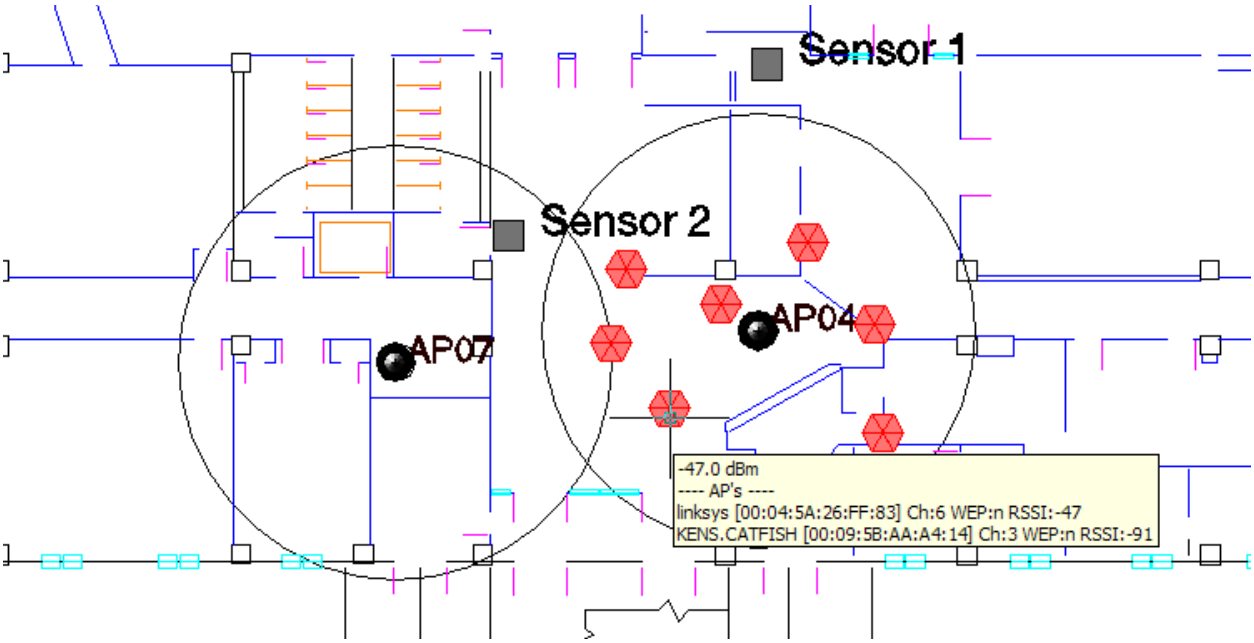


Figure 6.23: Graphical Markers

The example below shows a screenshot of a measurement session with Text Markers enabled:

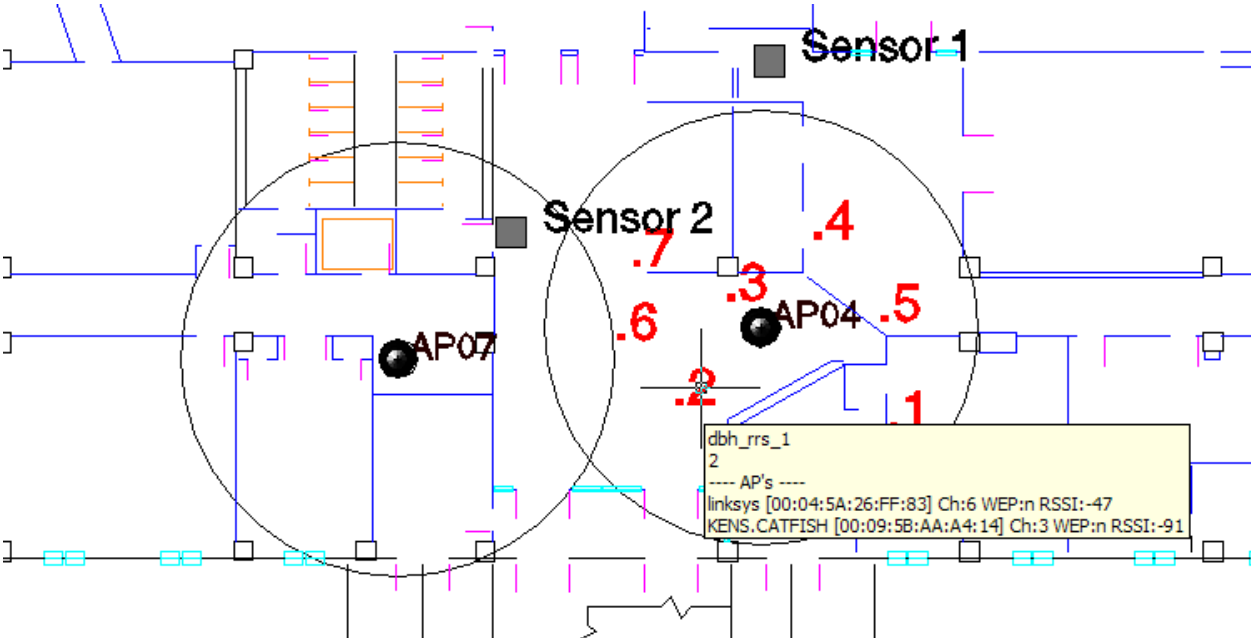


Figure 6.24: Text Markers

Show Markers/Hide Markers

To toggle graphical markers on, select **Network Verification > Display Measurement Data > Show Markers** (left screen shot, below). Toggle graphical markers off by selecting **Network Verification > Display Measurement Data > Hide Markers** (right screen shot, below).

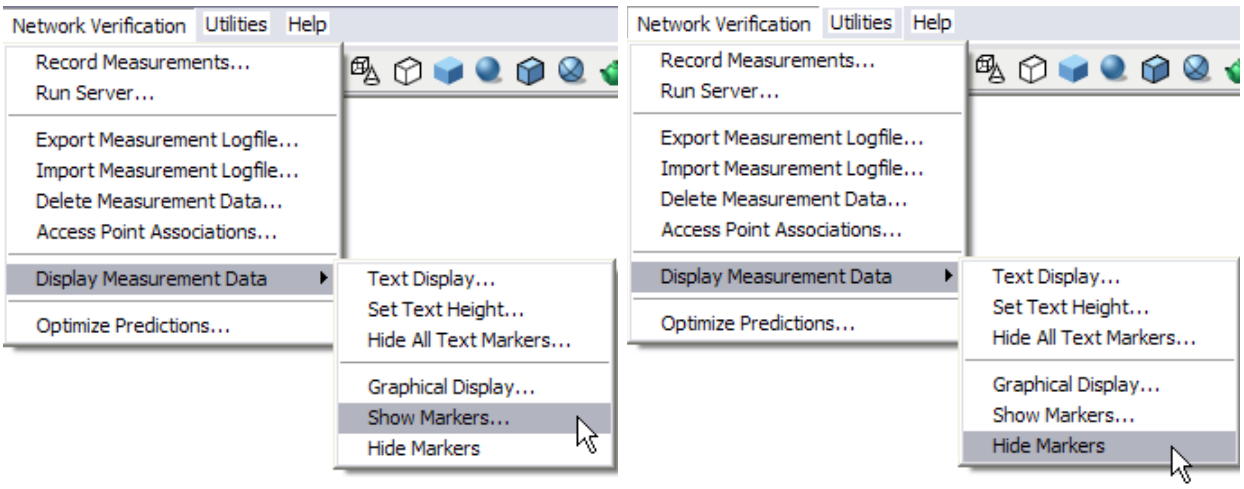


Figure 6.25: Toggling markers on/off

Optimizing Predictions

LANPlanner Solo's **Optimize Predictions** is the most efficient way to tune your wireless network simulation parameters and building model. Optimize Predictions compares predicted results to measured values and adjusts the building model and simulation parameters accordingly. You can use this capability to characterize unknown building materials, fine-tune predicted performance, increase prediction accuracy, and eliminate the need for lengthy site surveys.

Through a series of dialog boxes, Optimize Predictions leads you through the process of specifying measurement runs to include in your analysis, configuring the optimization analysis, and examining the results. The parameters obtained through tuning apply specifically to the transmit frequencies at which measurements were taken.

Parameter tuning requires, at minimum:

- **Virtual building model -** A 3D virtual building model created in the software drawing that models the building in which measurement data was gathered.
- **Virtual transmitter -** The formatted building must include at least one access point that represents the actual test transmitter(s) used during the on-site data collection process.
- **Measurement run -** At least one measurement run must be provided. The measurement run should consist of RSSI data for at least 20 positions scattered around the building, preferably more. The characteristics of the text transmitter used to gather the measurement data, should match the characteristics of the virtual access point in your drawing file.
- **Access point association -** The virtual access point and the measurement run must be explicitly linked in your drawing, via a formal access point association. The frequency at which measurements were taken, and the transmit frequency of the corresponding virtual transmitter must be very similar.

To begin the Optimize predictions process, select **Optimatic** > **Optimize Predictions** from LANPlanner Solo's tool bar:

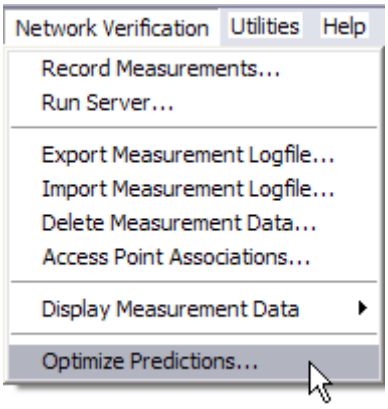


Figure 6.26: Selecting Optimize Predictions

The **Select Measurement Runs** dialog opens:

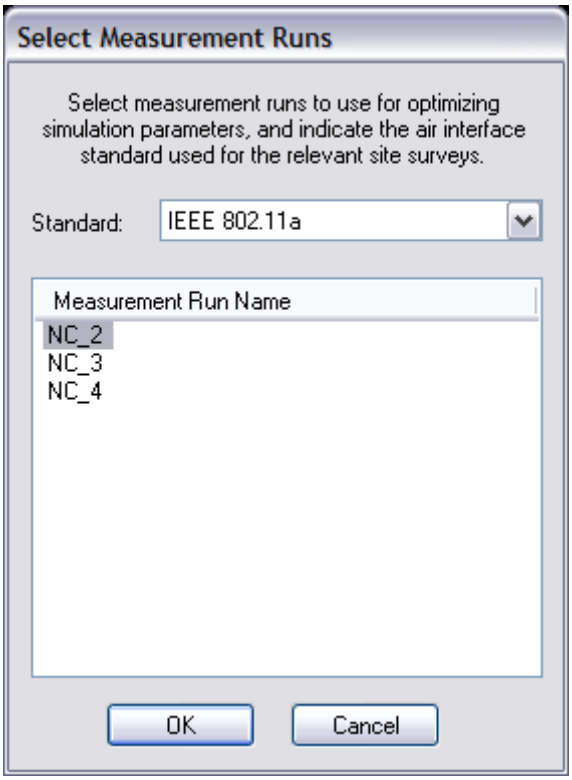


Figure 6.27: Select Measurement Runs dialog

Each optimization that you perform creates an intermediate file, the optimization data file (*.dat). By default, all optimization data files are placed in the **Optimized** subdirectory of the current project workspace and have the same name as the current drawing with the extension *.dat.

Select the **OK** button to progress to the next stage of optimization (see “Choosing a Frequency Band to Update”), or **Cancel** to exit the dialog.

Choosing a Frequency Band to Update

The next step in the process of tuning your simulation parameters is the choice of a frequency band to update with the new parameters.

The simulation parameters tuned by LANPlanner Solo include:

- Eight partition attenuation factors, which govern the losses incurred by radio signals when they penetrate obstacles such as walls.
- Five floor attenuation factors, which govern the losses incurred by radio signals when they travel from one floor to another within your building.

The partition attenuation factors are frequency-dependent, while the other parameters are not. For a given partition type, there may be multiple attenuation factors defined, one for each of several frequencies. This allows the partitions to behave properly for a range of different frequencies.

When you select the **OK** button from within the **Select Measurement Runs** dialog, the **Select a Frequency Band** dialog opens:

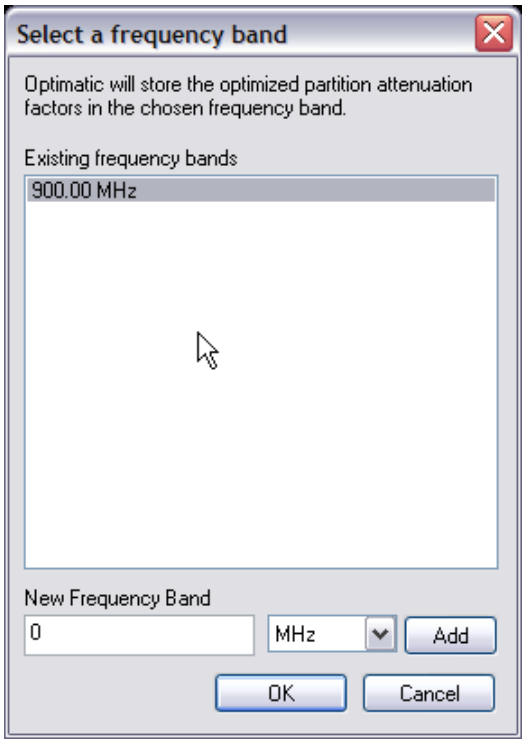


Figure 6.28: Selecting a frequency band

To progress to the next step of Optimize Predictions, select the proper frequency band from the list and click **OK** to execute Optimize Predictions and view optimization results.

Viewing Optimization Results

While running Optimize Prediction, LANPlanner Solo generates parameter values that provide the closest overall (average) match between measured and simulated signal power. All simulation parameter values are potentially adjusted, including the partition attenuation factors and floor attenuation factors.

After Optimize Prediction finishes, the **Optimized Parameter Values** dialog (Figure 6.29, below) displays. This dialog lists all simulation parameters and indicates their post-optimization values. Values marked with an asterisk, '*', indicates that the values did not change, and did not affect the simulation. For example, if you had a partition type of 'Solid steel' defined for your drawing, but no walls of that type were actually between an access point and a measured value, Optimize Prediction ignores that partition type, leaves its attenuation value unchanged, and flags it with an asterisk.

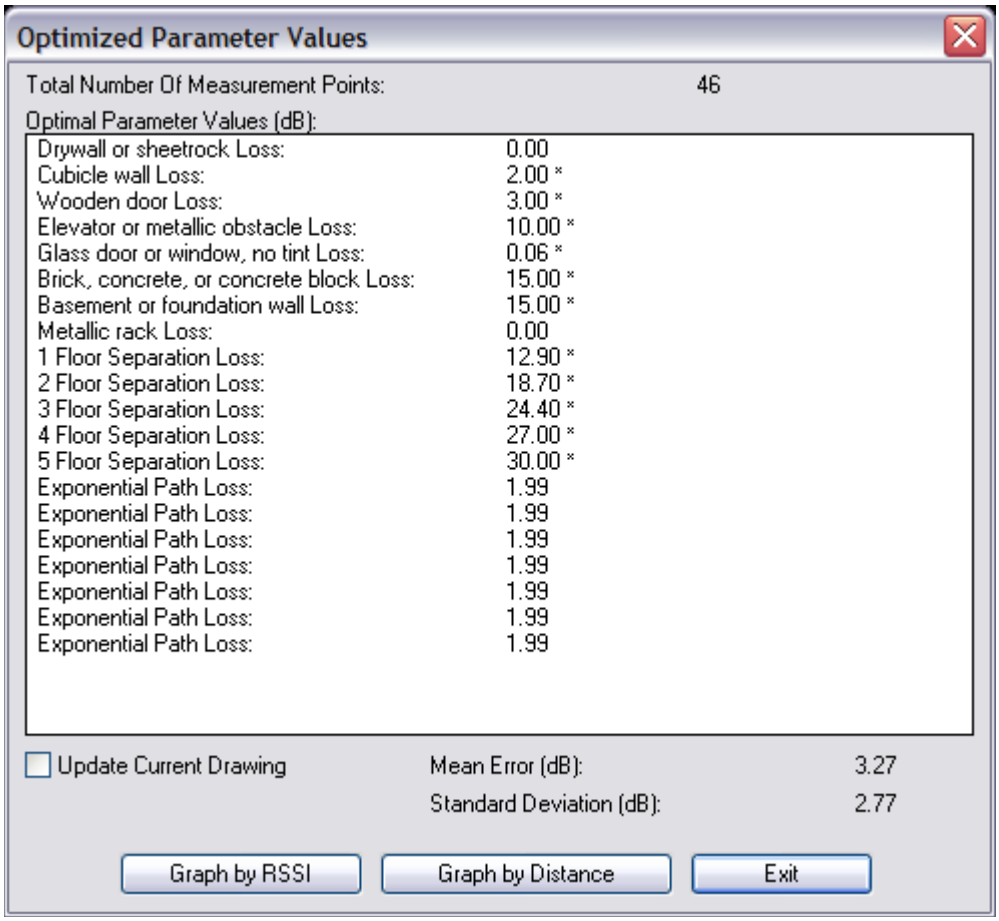

Optimized Parameter Values
Total Number Of Measurement Points: 46
Optimal Parameter Values (dB):
Drywall or sheetrock Loss: 0.00
Cubicle wall Loss: 2.00 *
Wooden door Loss: 3.00 *
Elevator or metallic obstacle Loss: 10.00 *
Glass door or window, no tint Loss: 0.06 *
Brick, concrete, or concrete block Loss: 15.00 *
Basement or foundation wall Loss: 15.00 *
Metallic rack Loss: 0.00
1 Floor Separation Loss: 12.90 *
2 Floor Separation Loss: 18.70 *
3 Floor Separation Loss: 24.40 *
4 Floor Separation Loss: 27.00 *
5 Floor Separation Loss: 30.00 *
Exponential Path Loss: 1.99
Exponential Path Loss: 1.99
Exponential Path Loss: 1.99
Exponential Path Loss: 1.99
Exponential Path Loss: 1.99
Exponential Path Loss: 1.99
Exponential Path Loss: 1.99
Update Current Drawing
Mean Error (dB): 3.27
Standard Deviation (dB): 2.77
Graph by RSSI
Graph by Distance
Exit

Figure 6.29: Optimized Parameter Values dialog

The **Optimized Parameter Values** dialog contains the following options and displays:

- **Update Current Drawing -** Updates the drawing file with optimized prediction results.
- **Mean Error/Standard Deviation -** These fields report the success of the optimization by presenting the average difference between measurement and prediction across all measurement points (average error) and the standard deviation of the post-optimized parameters.

- **Graph by Distance** - Displays a graph that plots the measured and predicted data. This enables you to see the differences between the original prediction, the measured data, and the prediction after optimization. The graph is plotted as dBm signal power values vs. the distance to the nearest antenna of the associated access point. The measured values are displayed for all measurement runs included in the optimization, as well as the predicted values pre and post-optimization. If there are multiple measurement values for a given distance, they are plotted at the same point on the horizontal axis. There is one prediction value for each measurement point.

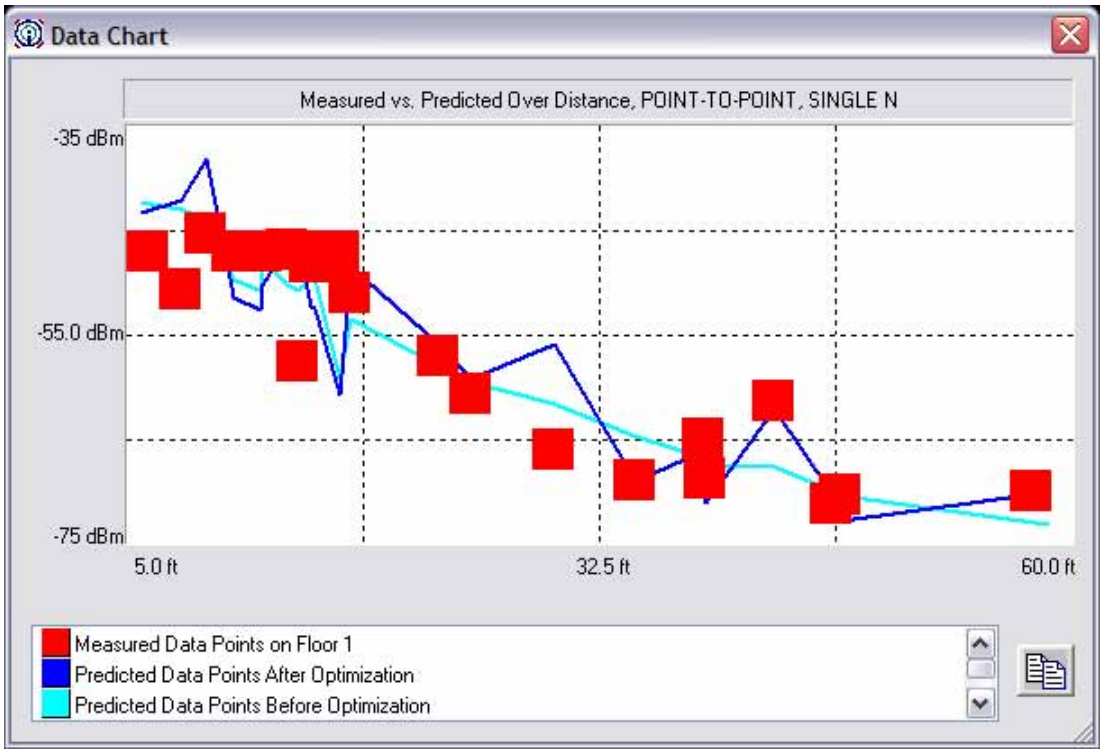


Figure 6.30: Graph by Distance chart

- **Graph by RSSI** - This option is designed to provide a different visualization of the difference between the predictions and the measured values. The **Graph by RSSI** option is similar to **Graph by Distance** as described above. However, the horizontal axis is now the dBm value of each measured data point.

  Observe that in **Graph by RSSI**, there are three data series in the Graph by RSSI plot:

  - Measured signal power versus itself (always a straight line)
  - Pre-optimization predicted signal power versus the measured signal power
  - Post-optimization predicted signal power versus the measured signal power

  Since the measured-vs.-measured line is always straight, variation from a straight line for the other (predicted) data series is an indication of the error. Ideally, all three data series would be perfectly straight. For example, if one measured point had a value of –73 dBm, and the predicted value for that point was –78 dBm before optimization, and –71 dBm after optimization, there would be three points plotted at the –73 dBm position on the horizontal axis: -71, -73, and –78 dBm.

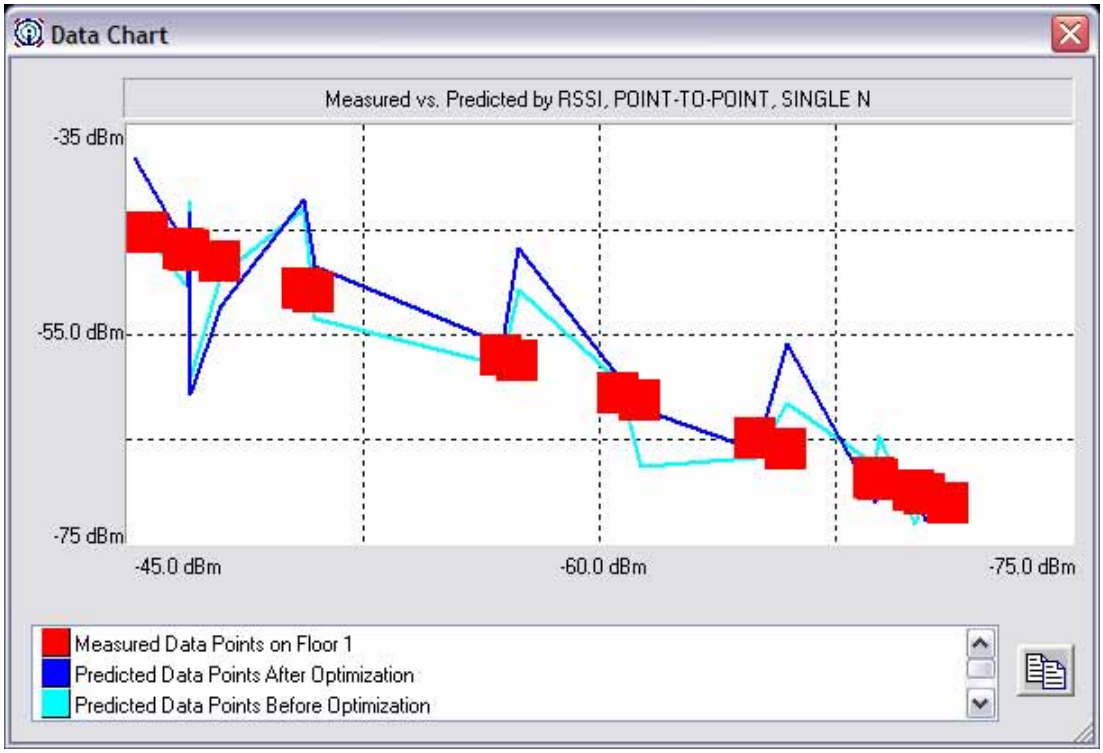


Figure 6.31: Graph by RSSI chart

After you are finished with viewing the Optimize Predictions results, select **Exit** from the Optimized Parameter Values dialog to return to the LANPlanner Solo drawing window.

7 Report Generation

Introduction

There are many different methods for generating reports with the output from LANPlanner Solo. This chapter discusses two general techniques for displaying data for use in presentations and reports. The following generalized categories will be discussed:

- Printing
- Screen Captures
- Exporting Graphics

Within these categories, there are many different ways to generate effective displays of your system designs. Although several methods are provided in this section, there may be many other ways to accomplish a given task when generating reports. The material in this section should only serve as a reference, without limiting your use of alternative report generation schemes.

Printing

You can output your drawing to a Windows printer by Accessing the menu command **File > Print**. Select a printer from the list of defined Windows printers, the number of copies you would like to print, and the paper orientation. Press the **OK** button to send the drawing document to the printer.

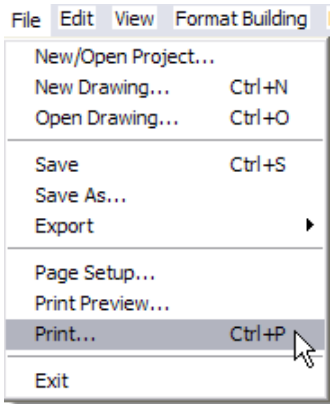


Figure 7.1: Printing

The drawing document will be printed exactly as it is currently displayed on the screen. Therefore, make sure to adjust the drawing to appear exactly as you would like it to appear in the final print out. You can use the **View** menu to change the way the drawing looks on the screen.

NOTE

Contour shading and wall partition shading will not be displayed on the printout of a drawing. Shading is an effect that applies only to the on screen view of a drawing after the non-shaded entities are rendered to the screen. If you wish to capture a view of the building in ***SW Isometric*** *view with a shading mode of* ***Flat Shaded, Edges On****, then you need to use the Windows* ***Print Screen*** *key to capture the desired output.*

Exporting Graphics

LANPlanner Solo can export the contents of the drawing to several types of files. To this, select **File > Export** and choose a file type:

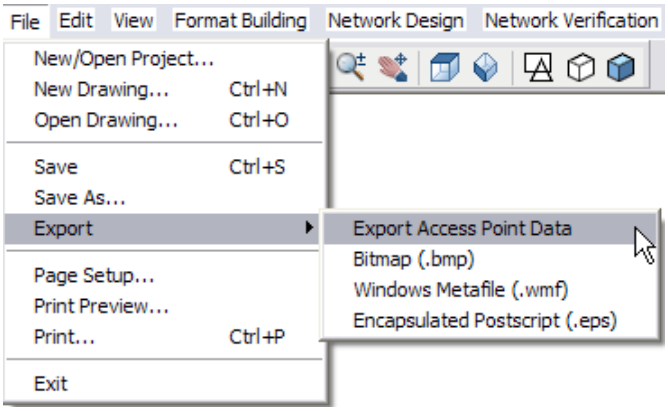


Figure 7.2: Supported export formats

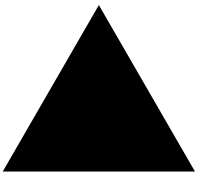
Draw a selection box around the contents of the screen you wish to export and press **Enter**. You will be prompted to choose a file name. Enter a unique name and press **Enter**. Depending on the file type selected (access point data, .bmp, .wmf, .eps) the selected entities will be stored in a file.

Screen Captures

Screen shots, sometimes referred to as screen captures, are user-accessible graphics, stored on the clipboard or in files, which contain a “picture” of the screen or some portion of the screen. All figures in this manual are examples of screen shots. Once a screen has been captured, you can easily insert it into other programs such as word processors, spreadsheets, publishing packages, etc. Usage of other software packages is left as a choice to you.

Third-party applications are available for capturing and editing screen shots. Without one of these applications, you can still take screen captures using Windows. To do so, press the **Print Screen** key on your keyboard. After pressing this key, the system will store the entire contents of the screen on the system clipboard. The screen can then be pasted into most applications such as word processors, spreadsheet software, and drawing packages.

Since this technique grabs the entire contents of the screen, you will have an image of your drawing and the surrounding windows on the clipboard. If you do not want to include the extra screen graphics, paste the clipboard into a drawing package and crop the image to obtain the desired effects. To capture dialog boxes such as those shown in this manual, you must hold down the **Alt** key while pressing the **Print Screen** key.



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